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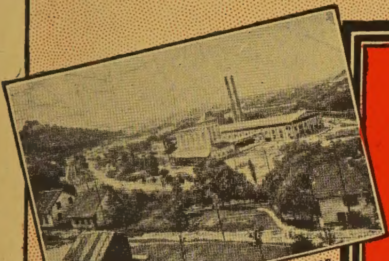
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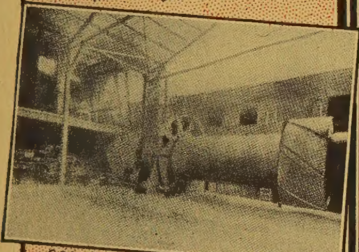
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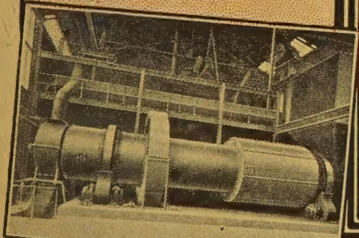
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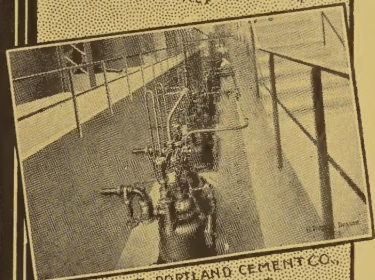
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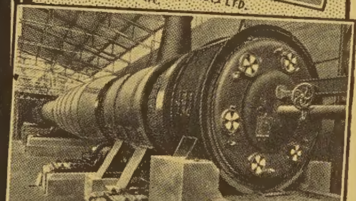
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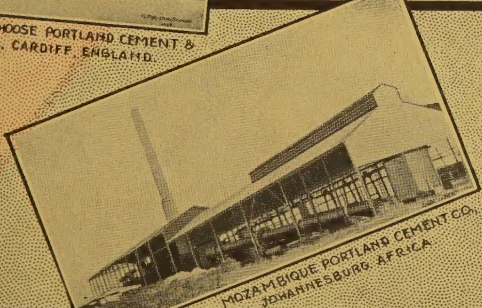
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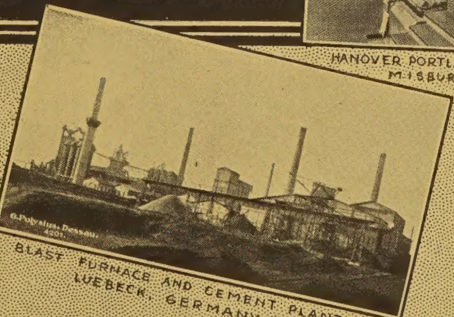
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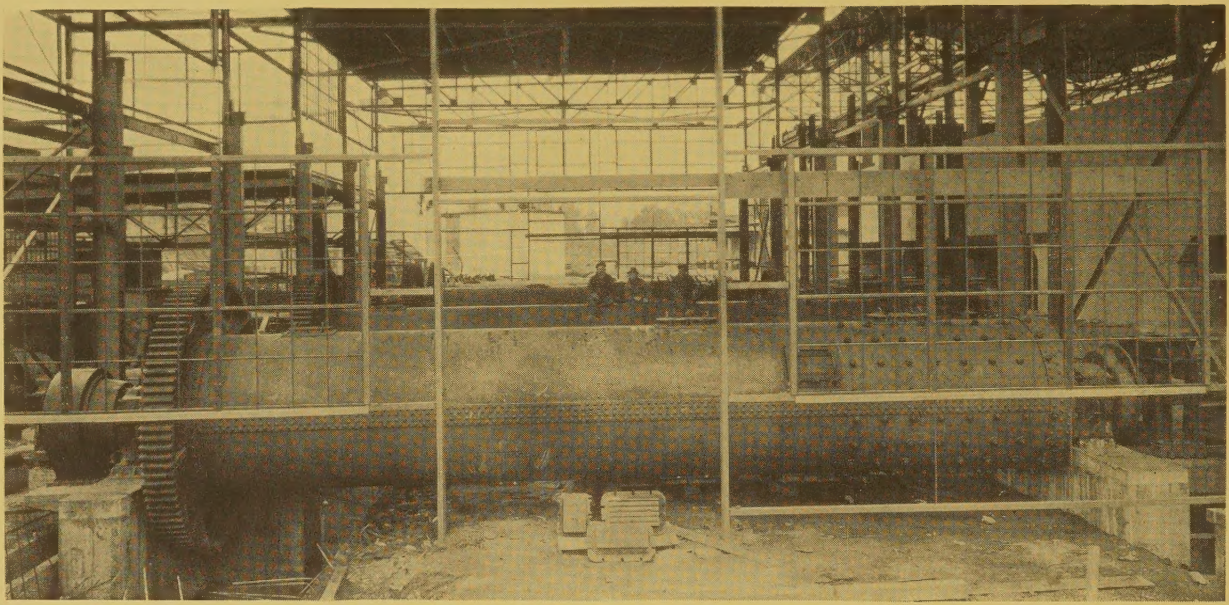

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The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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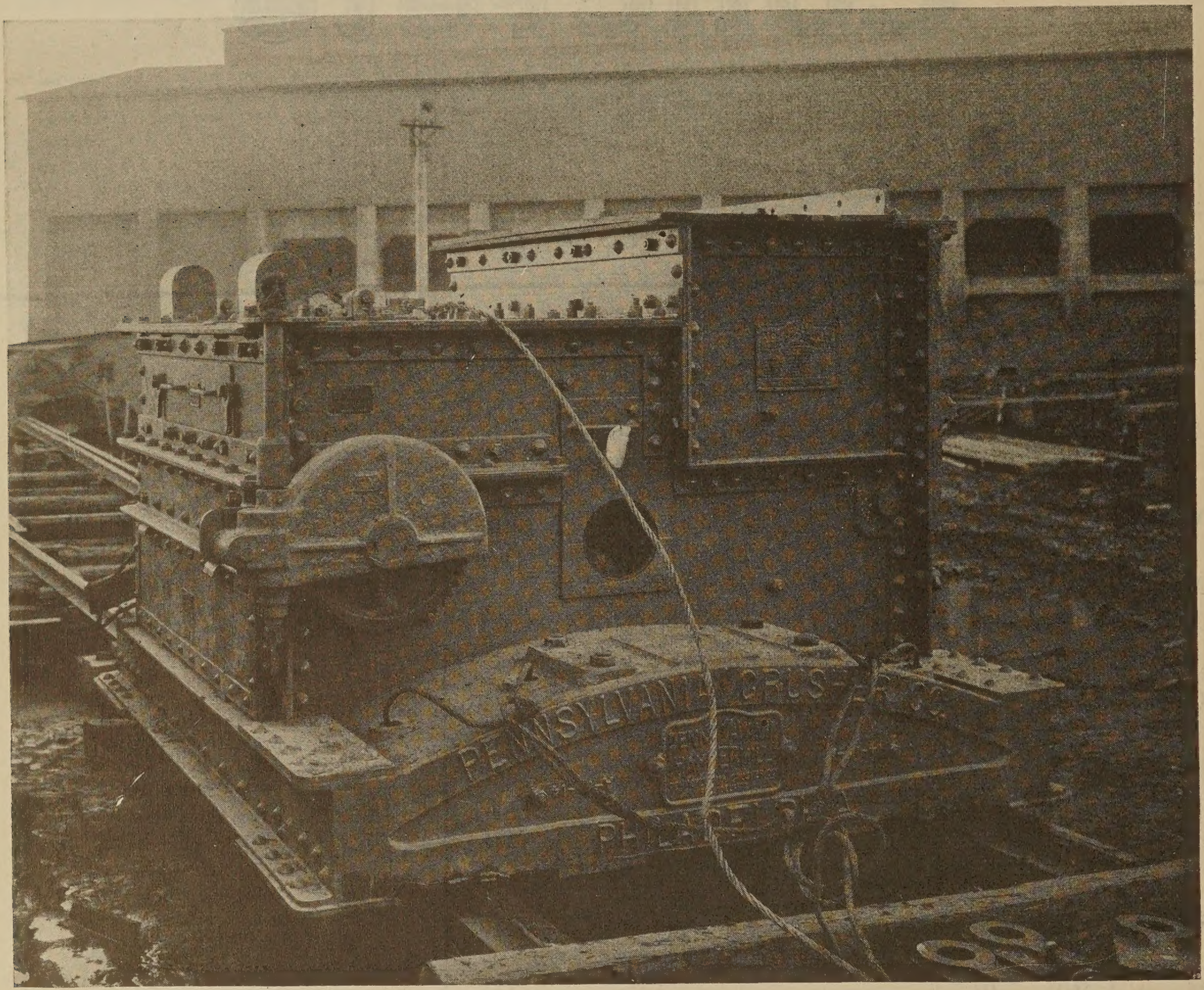

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MILL SECTION of

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Vol. 34 Chicago, January, 1929 No. 1

1928 Another Record Year for Cement Mill Safety

An Analysis of Progress Made During the Year in Accident Prevention—Twenty Plants Make Perfect Record—Look Forward to Still Better Records

By A. J. R. CURTIS

Assistant to General Manager, Portland Cement Association

PUT down 1928 as another record year for accident reduction in the cement mills. While final figures on accidents for the year will not be available for several weeks, the estimated reduction in totals is very encouraging.

During 1927 there were 1337 lost-time accidents in the 136 mills then reporting. The 1928 total is expected to be about 300 less with a dozen more mills reporting. This probable reduction amounts to around 22 per cent. During the last five years the number of mills has increased nearly 50 per cent and the number of accidents has decreased 68 per cent. The year now closing will probably show not more than one-third as many accidents as were recorded in 1924.

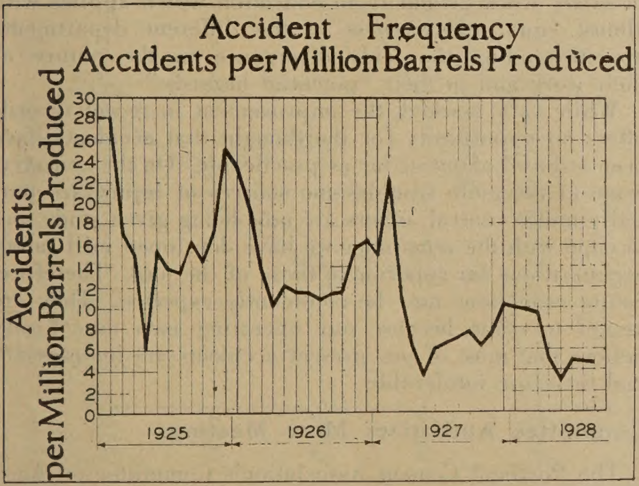
In the first 46 weeks of 1928 there were 953 lost-time accidents. It is interesting to note the period of time required in each of the past five years to accumulate approximately this same number:

In 1924—14 weeks with 105 mills reporting.
In 1925—16 weeks with 118 mills reporting.
In 1926—22 weeks with 124 mills reporting.
In 1927—35 weeks with 136 mills reporting.
In 1928—46 weeks with 150 mills reporting.

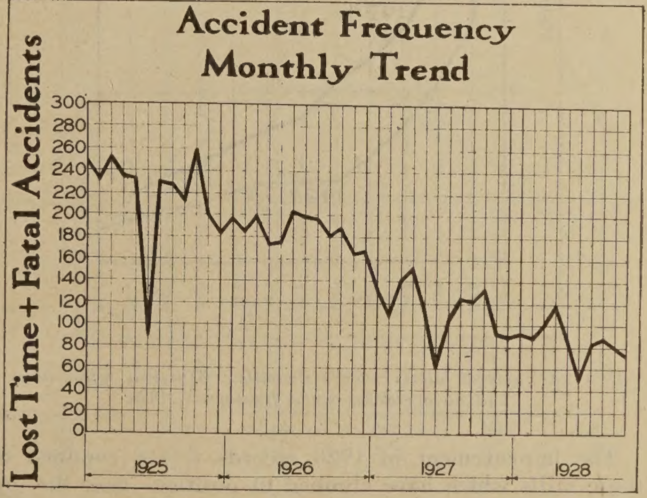
Isn't it surprising and most encouraging, to note that in 1928, 150 mills operated for eleven months with the same number of accidents that were suffered in one week over three months by 105 mills, in 1924?

Perfect Records on the Increase

As this is written there are three cement mills in the membership of the Portland Cement Association which have had no lost-time accidents for more than two years. They are the mill of the Cowell Portland Cement Company at Cowell, California, that of the Alpha Portland Cement Company at Ironton, Ohio, and that of the Lehigh Portland Cement Company at Iola, Kansas. The Newcastle (Pa.) mill of the Lehigh company and the Belleville (Ont.) mill of the Canada company recently terminated records of over two years without an accident and the Duluth mill of the Universal Portland Cement Company



Accidents shown in terms of cement produced. The highest rate shown was over 28 accidents per million barrels, for January, 1925; the lowest, 2.8 accidents per million for June, 1928—



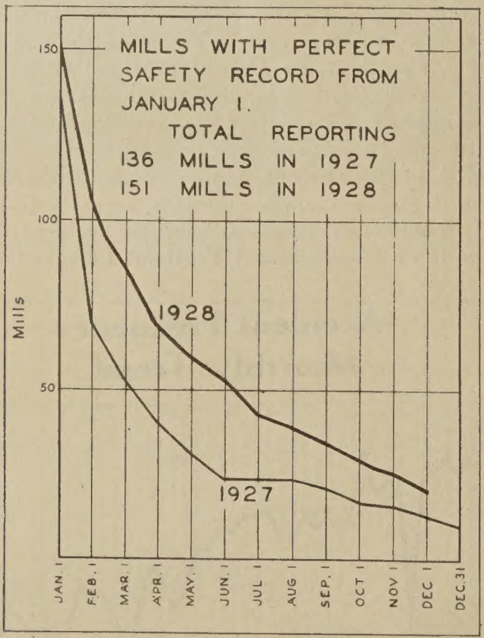
The decrease in accidents throughout the cement industry is graphically illustrated by the chart recording monthly progress since January, 1925 has had only one accident in a period of almost three years.

Nineteen and possibly twenty mills have had no lost-time accidents so far in 1928 and seventeen more have had but one accident each. These records, we believe, can hardly be duplicated in any industry of comparable hazards.

The operating mills which have reported no lost-time accidents during 1928 to date are as follows:

Alpha Portland Cement Co., Bellevue, Mich.
Alpha Portland Cement Co., Ironton, Ohio.
Alpha Portland Cement Co., Manheim, W. Va.
Basic Products Co., Kenova, W. Va.
Canada Cement Co., Ltd., Exshaw, Alta.
Consolidated Cement Corp., Mildred, Kan.
Cowell Portland Cement Co., Cowell, Calif.
Lehigh Portland Cement Co., Bath, Pa.
Lehigh Portland Cement Co., Birmingham, Ala.
Lehigh Portland Cement Co., Fogelsville, Pa.
Lehigh Portland Cement Co., Iola, Kan.
Lehigh Portland Cement Co., Sandts Eddy, Pa.
Lehigh Portland Cement Co., Ormrod, Pa., No. 3.
Marquette Cement Mfg. Co., Cape Girardeau, Mo.
Oregon Portland Cement Co., Oswego, Ore.
Pennsylvania-Dixie Cement Corp., Kingsport, Tenn.
Standard Portland Cement Co., Painesville, Ohio.
Three Forks Portland Cement Co., Trident, Mont.
Trinity Portland Cement Co., Dallas, Texas.
Virginia Portland Cement Corp., Norfolk, Va.
Wolverine Portland Cement Co., Quincy, Mich.

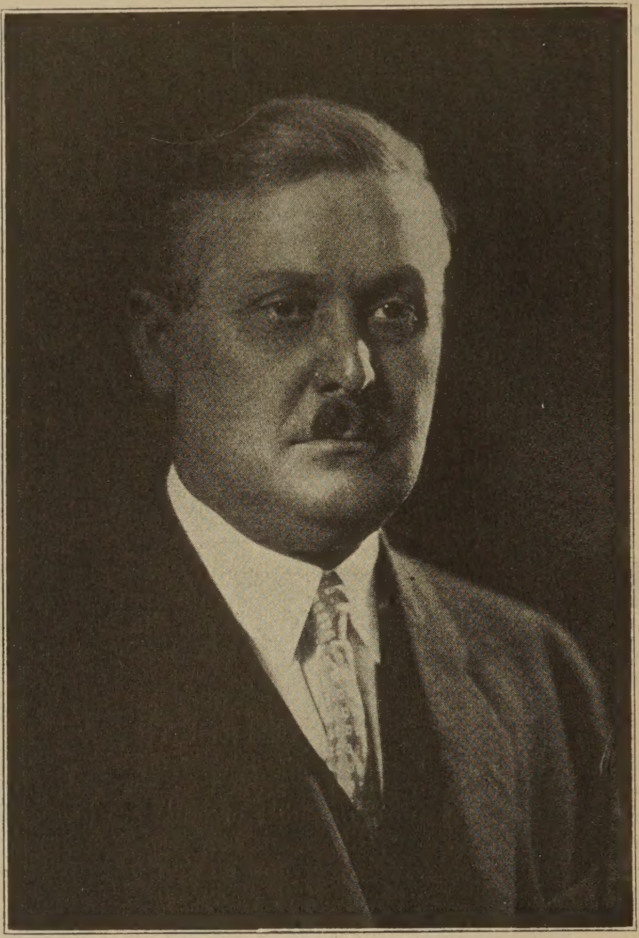
If the above mills can maintain a clear record until January 1 each will be awarded the Portland Cement Association trophy except the Trident plant of the Three Forks Portland Cement Company which did not operate the minimum period of six months required to win the award.



How the perfect safety scores dwindle. Nineteen mills have had no accidents since January 1, 1928

The improvement in 1928 records is not confined to those mills which have climbed to positions near the top of the list but is shown throughout the tabulation. For example, the mill with the poorest record for the first eleven months of 1927 suffered 84 accidents during that period, while the mill at the foot of the list during the corresponding period of 1928 suffered only 72 accidents.

Accident reductions continue to take place at approximately the same rate in the various departments, the uniformity of the downward trend in the different divisions of mill and quarry operation being one of the significant factors of the present trend. This factor, for example, indicates the effectiveness of devoting attention in safety work primarily to education which applies with almost equal effectiveness in the different departments notwithstanding the wide divergence in the nature of their work and in their "potential hazards."



J. B. John, president of the Petoskey and Sandusky Cement companies and vice-president of the Manitowoc and Newaygo companies, who is chairman of the Committee on Accident Prevention of the Portland Cement Association

While very marked, the improvement in recent records offers no opportunity for the thought that accidents have been reduced about as far as practicable. On the contrary, some of the more troublesome sources of injury are partially under control, others are now being given study and to cope with the remainder we have developed mill safety organizations far superior to those of the past. Therefore, future reductions may be confidently expected. They are bound to come because our operating men now firmly believe that most of our present accidents are unnecessary and therefore intolerable.

Committee Authorizes More Meetings

The Portland Cement Association's Committee on Accident Prevention attributes much of the success of its safety work to the system of regional safety meetings which are held annually in each of the principal cement producing localities. These meetings afford opportunity for study of the accident problems by mill superintendents and foremen, bringing association service to the men who need it and can seldom get away to attend national meetings. In 1928 the twelve meetings held were attended by representatives of 125 mills.

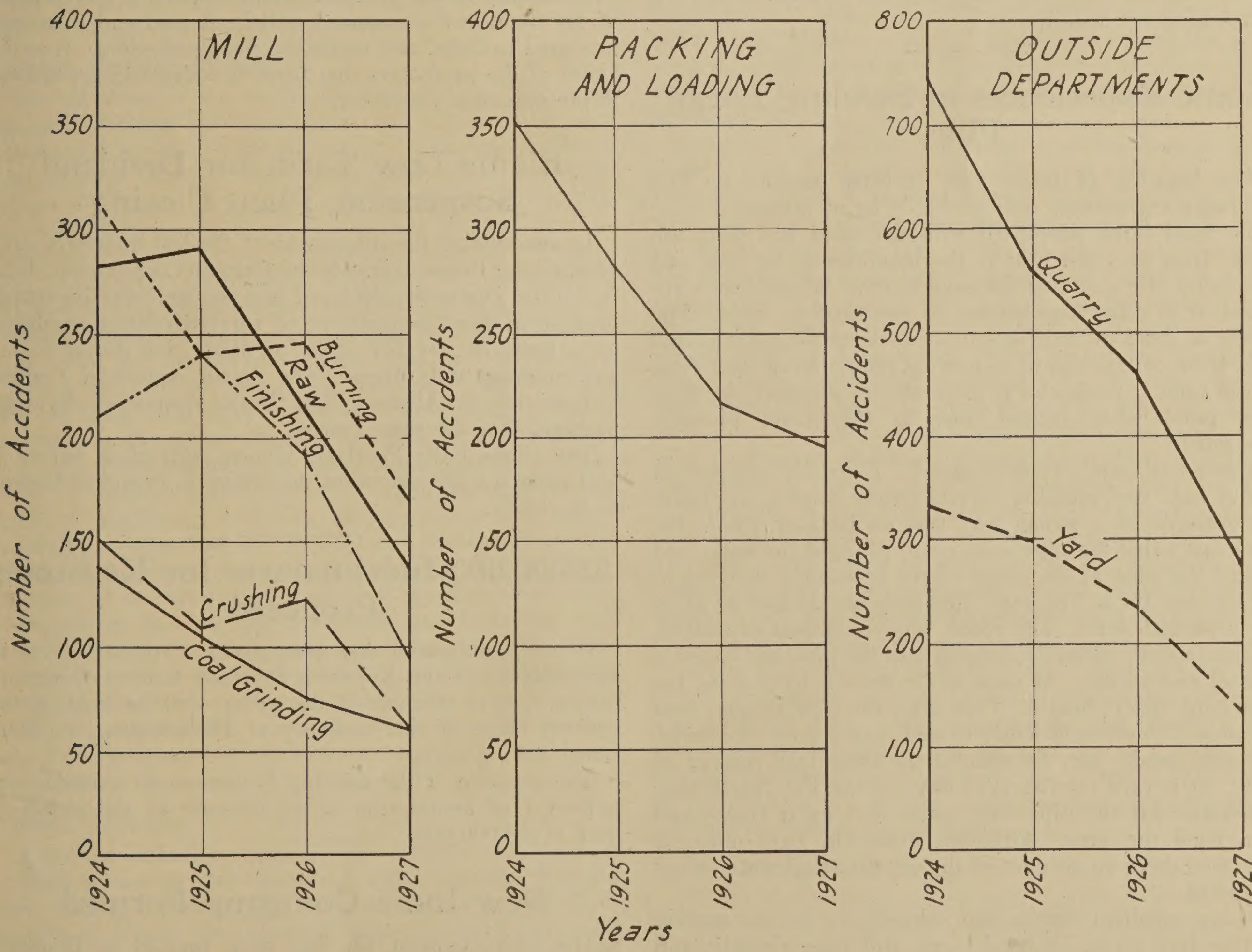
The association's committee recently decided to further expand the work by providing for 14 meetings in 1929, to be held at the following points: Allentown or Nazareth, Pa.; Albany, N. Y.; Pittsburgh, Pa.; Washington, D. C., or Norfolk, Va.; Chattanooga, Tenn.; Louisville, Ky.; Detroit, Mich.; La Salle, Ill.; Des Moines or Mason City, Iowa; Kansas City, Mo.; Dallas, Tex.; Salt Lake City or Ogden, Utah; Los Angeles and Seattle, Wash., or Portland, Ore.

In preparation for a June No-Accident Campaign in which every effort will be made to keep June, 1929, free from mishap to employes, the industry will engage in a three months' period of intensive first aid training under the direction of the United States Bureau of Mines. During this period classes will be held in practically all of the mills and quarries for groups ranging from ten to 150 men. In many of these places the "rescue" cars of the Bureau will be stationed and in others the instruction will be given by Bureau engineers from the eight first aid stations located in various parts of the country. Coincidentally, the cement mills will embark on their first annual community safety drive, organizing to carry safety instruction to the industrial and residential districts around the various mills. This work, with engineers of the U. S. Bureau of Mines participating, will be carried on by means of meetings held in local schools, at commercial, rotary and other clubs, Y. M. C. A. and elsewhere as required to thoroughly work up safety sentiment in these communities.

During June of next year the cement mills and quarries operated by members of the Portland Cement Association will engage in their greatest co-operative undertaking—to produce a big month's quota of cement without a scratch to any employe. Although recent June campaigns have been held up as example of good team work and extraordinary for the unique methods introduced, the committee in charge believes the big drive of June, 1929, will surpass anything of its kind presented in any industry.

Can Accident Reductions Be Predicted?

Outside of stating definitely that the reduction of accidents will continue in the cement industry; that there is nothing to suggest that the present rate is stationary and that retrogration is unthinkable, it is impossible to predict future results. I say this because every time we have ever fixed and announced a "reasonable" quota for improvement during a given period it has been exceeded. Experience almost justifies the conclusion that we may come as near to wiping out all of our accidents as 100 per cent of our mill men want to. Certainly, in this as in other fields of worth-while endeavor, real achievement is best attained by aiming for absolute perfection.



A comparison of accident reduction since 1924 *in the principal operating departments. Notice the quite similar downward trend of most of the curves, indicating that present methods of promoting safety are taking hold with a surprising degree of uniformity throughout the various and even dissimilar departments of the plants*

Peninsular Returns Marl Boats to Service

The Peninsular Portland Cement Company at Cement City, Michigan, is rebuilding its marl boat dredges on Silver Lake and three are expected to be in operation soon.

The company some time ago discontinued the use of the boats and shipped in lime rock from northern Michigan lake ports by way of Detroit. The marl, however, is near at hand and the cost of freight against the added cost of coal for dehydrating were found to balance each other.

Trinity Doubling Fort Worth Plant Capacity

The Trinity Portland Cement Company, Dallas, Texas, is now expending $50,000 in doubling the capacity of its Fort Worth plant. Buildings to house the additional equipment were erected at the time of the original plant construction.

Both raw and finished materials grinding mills have been purchased from the Traylor Engineering and Manufacturing Company, Allentown, Pa., a kiln from the Reeves Brothers Company, Alliance, Ohio, and motors and controls from the General Electric Company, Schenectady, N. Y.

The company's engineering department, headed by O. V. Bartholomew, will be in charge of all construction work and machinery installation.

Some Experiences in Bending Large Pipe

The bending of large pipe is often necessary. The following experiences will probably be of interest:

To bend large pipes, fill with dry sand and plug the ends. Heat to a red heat in the localities to be bent and then bend. Be sure that the sand is dry. Where bends are slight, it is often unnecessary to use sand or resin. The object of sand or resin is simply to keep the sides of the pipe from collapsing, or to prevent reduction of flow area. If wet sand is used, and if the ends are plugged, the pipe may burst when heated, due to the steam pressure generated.

Instead of sand, resin is good. There is, however, a "right way" and possibly several wrong ways to use resin. An example of a wrong way was an instance where the mechanic filled the pipe with resin, plugged the ends, and heated the pipe at the place where he wanted to bend it. He watched for a "red heat" just as he would had he filled the pipe with sand. The result was—a violent explosion.

To use resin correctly, pour it into the pipe and allow it to cool and harden. As soon as the resin is hard, bend the pipe cold. Don't heat it. Then after the pipe is bent, heat the pipe all over sufficiently to melt and remove the resin.

Equal results may be secured by using lead instead of resin. It is said that on cold days in the Far North they sometimes fill the pipe with water and let it freeze and then bend the pipe. Although plausible, care must be exercised there on account of the expansion of water when it freezes.

Many excellent mechanical devices are on the market for bending pipe. To bend large, stiff pipe slightly, and inexpensively, there is nothing handier or more efficient, in the opinion of many, than a hydraulic pipe bender driven by a hand pump.

Maritime Portland New Canadian Cement Manufacturer

The Maritime Portland Cement Company, Ltd., has been organized under a dominion charter and will manufacture cement at Brookville, N. B., Canada. Capitalization has been made at $1,000,000. The capital stock is divided into 7,500 shares of 7 per cent cumulative redeemable preferred stock and 2,000 shares of common stock, with no par value.

The incorporators of the new company are G. E. Chester Gandy, R. D. Paterson, Harry E. Reardon, T. P. Regan and Stanley G. Olive, all of St. John, N. B. These have also been named as the directorate of the recently launched firm.

The company is legalized to operate through Canada, including the manufacture and trading of portland cement, also to prospect and mine for clay, gypsum, ore metals and other minerals. It is also entitled to carry on engineering in connection with its business, and to develop and generate electric power.

The intention is to build a plant at Brookville, which is four miles east of St. John. The head office will be in St. John and the factory at Brookville, on the line of the Canadian National Railways. Buildings will be erected in the spring just as soon as the frost is out of the ground, according to the announced plans, and the manufacture of the cement is expected to start during the summer, following several weeks of installation of the machinery and other equipment.

According to the plans of the promoters, a public issue of the stock in the company will be floated and this revenue used to build and equip the proposed plant. It is the claim of the promoters that there is a demand for cement in the maritime provinces.

Blame Low Tariff for Dividend Suspension, Plant Closing

In announcing the suspension of the last quarterly dividend of the Pennsylvania-Dixie Cement Corporation, John A. Miller, chairman, declared that the step was inevitable because of the "competition of foreign cement produced on a basis of pay for labor of about one dollar a day and entering duty free." The North American Cement Corporation at Albany, New York, suspended dividend payments for the same reason.

The Glens Falls Portland Cement will close before it will make a wage reduction, according to President George F. Bayle, Sr.

$3,000,000 Indebtedness for Keystone Proposed

Official publication has been given a special notice to stockholders of the Keystone Portland Cement Company that a special meeting of the group will be held at the general office of the company at Philadelphia, on February 19th.

The purpose of the meeting is announced as being the approval of assumption of an increase of the indebtedness of $3,000,000.

New India Company Formed

The Okha Cement Co. has been formed in Bombay, India, to take over the plant and properties of the Dwarka Cement Co., now liquidated. Production will begin in January.

What of 1929?

An Analysis of Present Conditions in the Cement Industry and Their Possible Effect on Conditions During 1929

By B. F. AFFLECK
President, Universal Portland Cement Co.

THAT conditions in 1929 will approximate those in 1928 so far as the cement industry is concerned, but will involve some serious problems to solve that make the outlook seem less rosy, appears to be indicated at this time.

The present year seems to have broken all records both as to value of construction contracts awarded and as to the amount of cement shipped. On December 1, figures show that contracts awarded for the first eleven months of 1928 for the 37 states east of the Rocky Mountains (covering an estimated 91 per cent of total construction) exceeded those for a similar period over a similar area in 1927 by about $370,000,000, or 6 per cent. Cement shipments for the first eleven months of 1928, according to the U. S. Bureau of Mines, were over 168 million barrels, exceeding those for the same period last year by 4½ million barrels.

Before citing reasons for the belief that 1929 will approximate this 1928 record, mention may be made of the anomaly that in the face of an increasing demand for cement, its profitable manufacture becomes increasingly difficult. There are two main reasons for this condition.

Foreign Cement Inroads

One of these is the continued importation of foreign cement, admitted duty-free and made under labor conditions and a wage scale which would be intolerable in this country. During the current year about 3,000,000 barrels of cement were imported. Foreign manufacturers pay their labor only about one-quarter of that paid by American manufacturers. Transportation costs for shipping cement by water from Belgium, for example, to Philadelphia, especially when shipped as ballast or in subsidized bottoms or both, are less than rail transportation costs from the nearest American plant to Philadelphia. There is no tariff to protect the American industry. Last year at least two plants were shut down, according to accounts in the press, because of this foreign competition. And this affects not only cement producers and labor in cement plants but also railroads, coal mines, quarries, machinery and bag manufacturers and others supplying materials or service to cement manufacturers. To protect American interests, a fair tariff restriction is imperative in order to equalize the difference between foreign and American manufacturing costs and to enable the American manufacturer to continue operation with a fair profit and according to present American standards of living. Even with a growing demand for cement, the American industry cannot prosper unless competition it meets is on an equitable and American basis.

Excess Capacity

A second difficulty faced by the industry is its excess producing capacity as compared with demand. For the year ending November 1, 1928, according to the U. S. Bureau of Mines, the cement industry shipped only 74.1 per cent of the cement it was able to produce. In 1928 with a producing capacity of 220 million barrels, it will ship only about 175 million barrels. In other words, it could produce 45 million more barrels than it ships. With the frequent construction of new plants or additions to existing ones, producing capacity continually keeps ahead of demand no matter how that demand increases. The result is that even with maximum plant efficiency, cement manufacturing becomes decreasingly profitable.

Keeping these problems in mind in order to prevent too optimistic a view, it seems reasonable to believe that construction and the demand for cement may continue in 1929 at about the same rate as in 1928. Reasons for this view are here briefly cited.

Large Construction Volume Expected

Construction should continue in large volume because business in general, according to authorities who study the matter, promises to be good. There will be no business depression in 1929, they forecast. Construction is an integral part of business as a whole and should go along with it. While there has been great activity in the stock market, with people becoming "stock conscious" rather than "bond conscious," and while money has been firm, no credit shortage for business uses is in prospect, economists say. Adequate funds will be available for all legitimate building, they believe.

A second reason for believing in a continuance of a large volume of construction is the fact that such a volume seems to be a normal thing. While we have overcome the shortage following the war, current needs, year by year, are so great that continued large scale construction is required. Population increases at the rate of about 15 per cent during a 10-year period. In the next 10-year period we therefore must provide for 18 million more people than we have today. That means millions more homes, more apartments and hotels for them to live in, more plants for them to work in and to produce necessities, more churches, schools and theaters for them to attend, more water and sewer systems for their service, more pavements for them to drive over, more of everything.

According to one authority, the United States rebuilds itself every 11 years. For example, if there were 70 billion dollars worth of construction in use in 1920, there will have been built—between 1920 and 1931—70 billion dollars worth of construction to replace that which has become obsolescent and to care for new needs. With a continuance of business prosperity, which seems assured, with a normal increase in population and with people demanding more and more modern, convenient and beautiful surroundings in buildings just as they do in automobiles, kitchen equipment and other things, it seems reasonable to believe that the present large volume of construction and use of cement may continue.

Public Works Will Be Active

Public works construction also promises to be active in 1929. In case there is a lessening in residential, commercial or industrial building, as some authorities predict, the activity in public improvements may take up the slack. For example, three states alone have already budgeted over $300,000,000 worth of paving for 1929, while the flood prevention work in the Mississippi Valley planned for 1929 aggregates between $300,000,000 and $400,000,000. These two items alone amount to nearly 10 per cent of the value of total construction of recent years. To them can be added pavements, bridges and other improvements in the 45 other states, the increase in modern sewer systems which many cities even of considerable size do not now possess, the nation-wide movement for grade separations, the program of wider roads and streets, construction of railroad terminals, subways and elevated thoroughfares, the speedy development of internal waterways which has been promised by the new national administration, and other public works which, taken together, indicate a substantial building program in this field.

Other Uses for Cement

A final reason for expecting a continued demand for cement is in the new uses that are being found for concrete. For example, concrete block increased 610 per cent in the last eight years, from 50 million to 355 million block. There are reasons to believe that this is only the beginning of a still greater use of such products. Again, concrete floors, which are attractive, permanent, firesafe and economical, are replacing floors made of other material. In the same way, just as highways, which formerly were built of other material or not at all, are now more often built of concrete, so city streets more and more are coming to be constructed of concrete. Another new use for concrete is in connection with airports where concrete is recognized by aviation authorities as an ideal material with which to build taxi strips, runways and buildings. Stucco homes made with portland cement, so common in California and Florida, are likewise becoming more popular throughout the country. Reinforced concrete buildings even of great height, ornamental concrete, concrete piles, concrete sewers, roofing made with portland cement and other types of construction call each year for increasing quantities of cement.

While these new uses for concrete combined with those which have existed before indicate a substantial demand for cement in 1929, it should be borne in mind that cement producers cannot look forward to a profitable year unless some solution is found for the serious problems that now face the industry—excessive producing capacitv and large imports due to lack of tariff protection.

Self-Unloading Equipment for Petoskey Boat

The Petoskey Portland Cement Company, Petoskey, Michigan, is having the cement carrier "J. B. Johns" reconditioned and equipped with a novel self-unloading apparatus. The craft will operate on the Great Lakes. It is a reciprocating engine-driven craft, and the unloading equipment will be arranged for electric operation, although the steam drive will be retained.

Power for the electric equipment will be supplied by two 400-kilowatt, 480-volt, 3-phase, 60-cycle turbine generators. These and the other electric devices for the ship are now being built by the General Electric Company. All auxiliaries will operate directly from the turbine generators without the use of any transformers or motor-generators sets, except for lighting purposes.

The principal auxiliary equipment will be two Fuller-Kinyon cement pumps each driven by a mill-type, 175-horsepower, 900-r.p.m., slip-ring, induction motor with magnetic control. There will also be two screw conveyors each driven by a 100-horsepower, 900-r.p.m., slip-ring, induction motor with drum controllers, and two cross conveyors driven by 20-horsepower motors. Power for lighting will be supplied by a 12-kilowatt motor-generator set.

The boat is expected to go into service by spring.

Big Attendance at Pennsylvania Safety Meet

The Eastern Pennsylvania Safety Council met on December 7th at Easton, Pa., with about 600 persons in attendance. A banquet which included an address by Major Henry A. Reninger, of the Lehigh Portland Cement Company and president of the National Safety Council, brought the sessions to a close.

The morning session was devoted to discussion of various phases of public safety.

At the following session Harry D. Immel, of the Department of Inspection of the State Department of Labor and Industry explained Pennsylvania's new plan of factory inspection. "A Good Industrial Safety Program" was outlined by R. E. Motley of New York. The third and last speaker was F. W. Willard of New York, who spoke on "What May an Industry Expect from a Health Program."

Huron Has New Distribution Building

The Huron Portland Cement Company during November completed and placed into operation its new storehouse and packing plant on the north side of the Buffalo river, at Buffalo, N. Y. The first cargo for the new warehouse, 30,000 barrels of bulk cement, arrived on November 12 via the steamer John W. Boardman.

The plant has a capacity of 125,000 barrels, can ship about 15,000 a day and has unloading facilities capable of handling a full cargo of 40,000 barrels in 18 hours. The building is of reinforced concrete.

The company has three steamers in operation—the John Boardman, of 36,000 capacity; the S. T. Crapo, 42,000 barrels and the Samuel Mitchell, 14,000 barrels.

Walter C. Nuhr has been appointed superintendent of the Buffalo plant and Ray Mooney, district sales manager.

Volunteer Production Trebled; More Planned for 1929

Increase of production from six carloads to twenty carloads daily has been effected by the Volunteer Portland Cement Company at Knoxville, Tenn. In addition, plans to install a third unit during 1929, to raise production 50 per cent, have been made.

The third unit, consisting of a kiln and accompanying equipment, will call for an expenditure of about $500,000.

Indiana Price Lowered

A price reduction of ten cents per barrel at the mill was announced as effective on December 10th by the Indiana Portland Cement Company.

Lehigh Stock

Lehigh Portland Cement Company stock in November was expected to show around $2 a share in earnings for the quarter ending Nov. 30th.

Monolith Portland Midwest Co. Builds New Plant at Laramie

Will Make Portland and "Plastic" Cement—Unusually Favorable Conditions in Raw Material Supply—Details of Plant Layout and Equipment

TWO and one-half miles east of Laramie, Wyoming, where the wide western plains meet the first ranges of the Rocky Mountains, a new, modern cement plant is nearing completion. It is being built by the Monolith Portland Midwest Co., a subsidiary of the Monolith Portland Cement Co., of Los Angeles.

The silos and pack house

The mill, which is located adjacent to the main line of the Union Pacific Railroad and the Denver-Laramie Highway at an elevation of 7200 ft., enjoys the unique distinction of being the highest cement plant in the United States. It is to be a wet process mill, designed and built under the supervision of F. L. Smidth & Co. An initial capacity of 2000 barrels a day will be provided for.

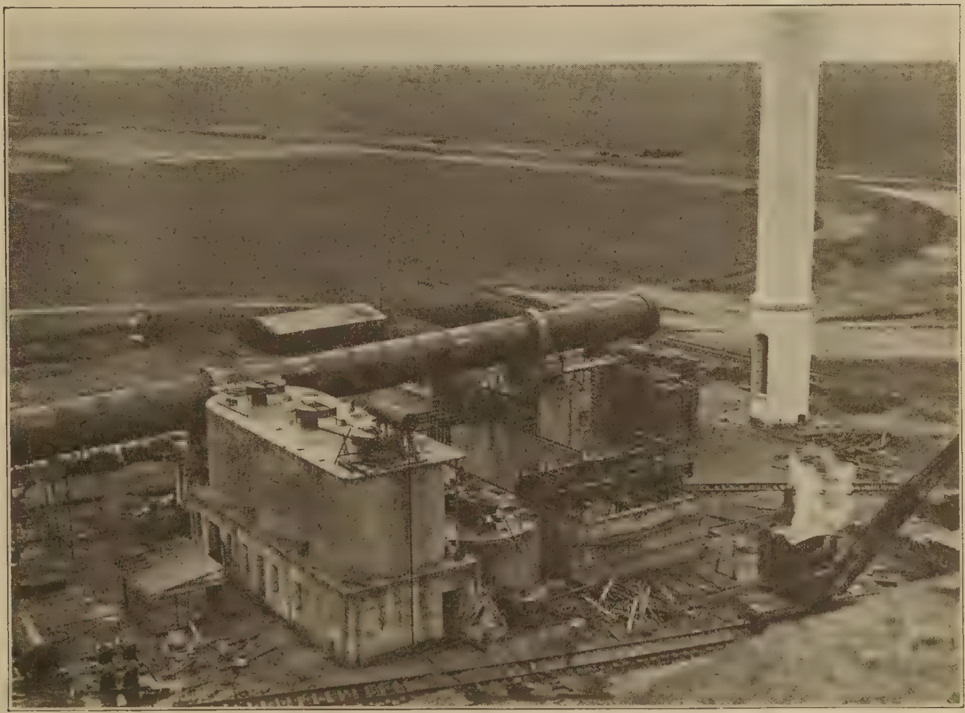
As can be seen by the plant layout, each department is so placed that it can be extended without interfering with operation. Space is provided so that additional units of equipment may be added to bring the capacity of the plant up to approximately 6000 barrels a day.

One of the features of the plant is the raw material deposit. The raw materials are found in almost perfect proportions, and are easily quarried and easily ground. They are similar to those used at the Fort Collins plant of the Colorado Portland Cement Company (described in the December, 1926, issue of CONCRETE). The strata from which they will be taken are from 60 to 80 ft. deep, and underlie the entire 2200 acres purchased by the Monolith company.

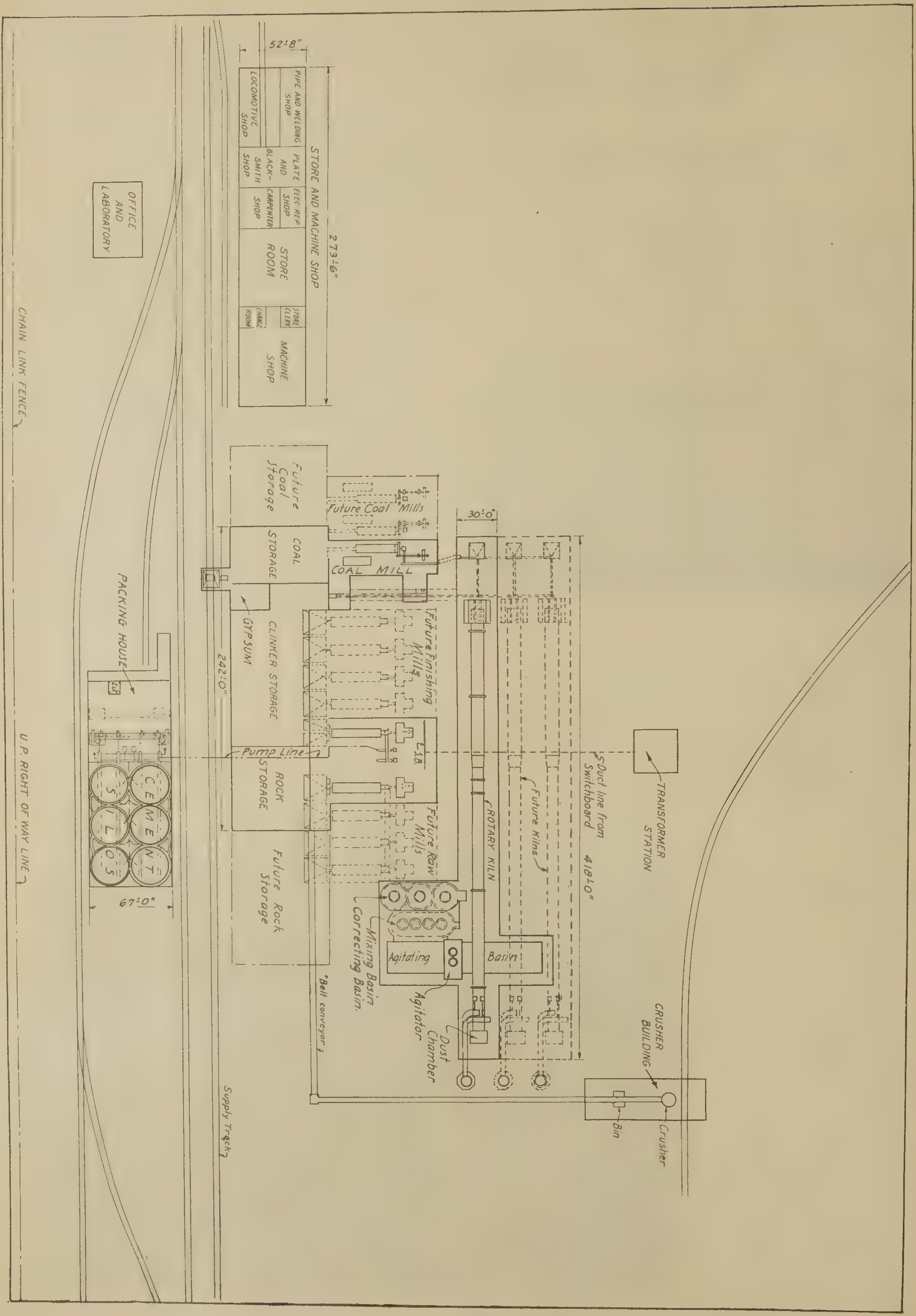
There is very little overburden at the quarry and very little blasting will be required—two items that make for very economical operation. Only black powder will be used for such primary shooting as will be required, and no secondary shooting will be necessary.

Typical chemical analyses of samples of high and low calcareous rock from the quarry are as follows:

	High, Per Cent	Low, Per Cent
Titration	87.9	36.1
SiO_2	7.0	44.4
Al_2O_3	2.0	10.4
Fe_2O_3	1.0	3.3
CaO	49.9	20.5
MgO	Trace	1.0
Loss on ignition	39.5	18.7



View from top of pack house, showing the upper end of the kiln and the slurry basins



Layout plan of the new Monolith Portland Midwest Co.

These raw materials, when properly mixed, will give a raw mixture which clinkers very satisfactorily at an average temperature about 50 deg. F. lower than is normally required for the production of good sound clinker. The quarry is located on the Laramie River, 9 miles west of the plant. A Marion steam shovel equipped with 1 cu. yd. dipper was brought from the Monolith Portland Cement Co.'s quarry at Monolith, Calif., to Laramie, and placed in the new quarry for the initial operation.

The materials storage building

A standard gauge railway is now being built by the Laramie Valley Railroad Co. between the quarry and the plant site. The rock will be loaded into specially built cars, each of which will be equipped with scoops having a capacity of 10 cu. yds. These scoops are placed transversely on the car frame proper, and are hinged at one side so that they will discharge their loads by simply lifting the opposite side of the scoop. Approximately 700 tons of rock will be required daily for the initial operation of the plant, which allows for a 6-day per week operation of the quarry. The rock will be brought to the plant by a locomotive having a tractive power of 27,000 lbs., which was purchased from the Union Pacific Railroad.

At the plant site, the quarry track will form a loop which passes through the westerly end of the crushing plant. This loop will be placed on an embankment approximately 4 ft. high at the crushing plant proper and will have an 0.8 per cent grade towards the crushing plant. The rock train, brought to the plant site by the locomotive, may then be handled by gravity through the crushing plant and the locomotive may be released for other duties.

As the rock cars enter the crushing plant, the scoops on the rock cars will be discharged into a 36-in. Traylor gyratory crusher driven by a 200 h.p., 2200-volt, slip-ring motor. The tipping of the scoops will be accomplished by means of a Northern Engineering Works traveling crane. This crane, which is hand-operated, but equipped with electric hoists, will also be used for making repairs to any of the equipment in the crushing plant.

To avoid having too high an embankment for the track entering the crushing plant, the gyratory crusher is set in a pit 30 ft. deep and located at one side of the railroad track. The crusher discharges the rock which has been reduced to a maximum size of 5 in. to a Chain Belt Co.'s super-capacity inclined elevator. This elevator is equipped with 48-in. wide buckets and has an intermittent maximum capacity of 500 tons per hour. It is operated by means of a 60 h.p., 2200-volt, slip-ring motor and a Cleveland Worm & Gear Co. speed reducer. The rock is discharged from the elevator into a storage bin which will reduce the fluctuation in the flow of material caused by the intermittent discharge of rock from the railroad cars.

The rock is drawn from the bottom of this bin by a Pennsylvania Crusher Co.'s reciprocating feeder which discharges into a Pennsylvania No. 12 Thor series hammer mill, driven by a 220-volt, 300 h.p. slip-ring motor. Here the rock is reduced to a maximum size of ⅝ in.

The discharge from the hammer mill is carried by an inclined belt conveyor 30 in. wide to a horizontal 30-in. belt conveyor placed at right angles to the former belt conveyor. The horizontal belt conveyor discharges the rock into the raw material storage. The mechanical equipment of these two belt conveyors was furnished by the Chain Belt Co., and the rubber belts were furnished by the Pioneer Rubber Mills. Both belt conveyors are operated through Cleveland Worm & Gear Co. speed reducers.

A portion of the exposed strata from which the raw materials will be taken

All of the electrical starting and control equipment as well as sequence interlock for the entire crushing plant is located in a separate room. This is done as a safety measure and to reduce the harmful effect of dust, also to facilitate maintenance. However, a master push-button control station is located at a central point and there are also found ammeters and wattmeters showing the load of all of the motors of the crushing plant.

Raw Material Storage

The storage building is of the concrete retaining wall type and is 61 ft. wide by 242 ft. long. It is divided into compartments for rock, clinker, gypsum and coal. The initial capacity of the rock storage is approximately 5500 tons, but this storage can be easily extended to any size which may later be found desirable. The clinker storage has a capacity of approximately 57,000 bbls. and the gypsum storage has a capacity of 900 tons. The initial capacity of the coal storage is 1900 tons and this storage may also be extended, if desired.

Coal and gypsum are brought to the plant in railroad cars which discharge into a track hopper below which is located a Mead-Morrison coal crusher of the duplex roll type, driven by a 40 h.p. motor. Here the coal and gypsum will be handled by a bucket elevator to storage. This elevator is provided with the proper spouting arrangement for discharge to either the coal or gypsum storage. Furthermore, the boot of the elevator is connected with the coal storage so that coal may be withdrawn from storage and may be discharged through a spout on the outside of the storage proper. This arrangement will be used for coaling the locomotive.

A 76-ft. span Harnischfeger 440-volt, three-phase electric traveling crane equipped with a 3 cu. yd. Hayward clamshell bucket traverses the entire storage building, and will be used for feeding the various mill bins.

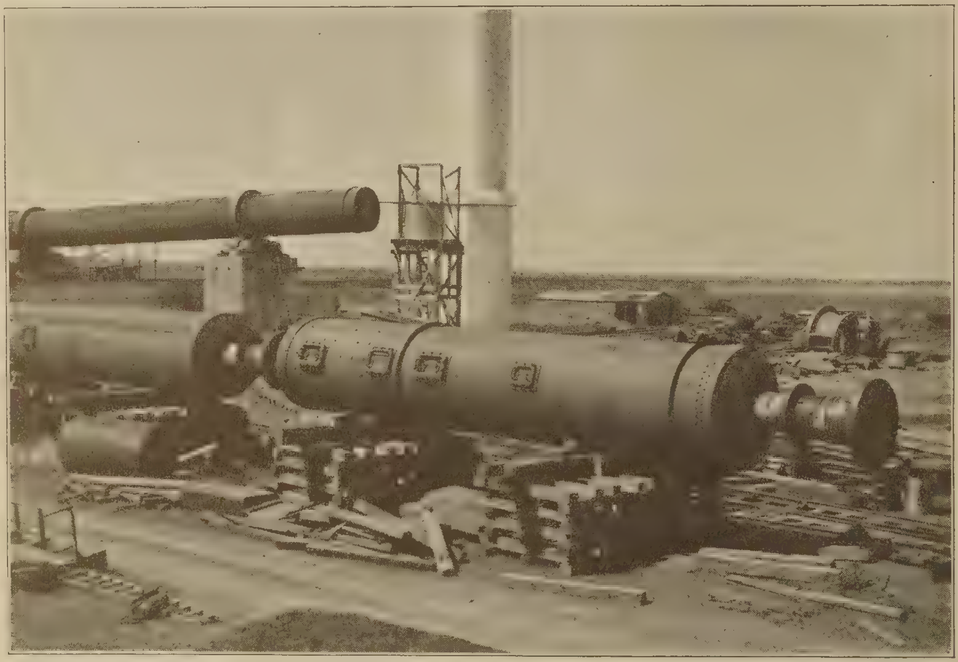
The storage building is designed in such a manner that additional mill bins can easily be installed without disturbing the operation of the plant.

Grinding and Burning

The initial installation of grinding machinery in the raw department consists of one F. L. Smidth Unidan mill. Since the raw materials as quarried are practically of the proper mix, no proportioning is required at the mill, which is equipped with a single F. L. Smidth cradle feeder. About 38 per cent of water is added to the raw materials as they enter the mill. The raw mill is of the three-compartment type and is equipped with a patented screening device between the first and second compartments. This particular arrangement of the Unidan mill has proved to be very efficient in that all the particles of material which are too coarse to be efficiently ground by the smaller grinding bodies in the second compartment are returned to the first compartment for regrinding before passing on, thus increasing the efficiency of all the compartments. It further insures that the material discharged from the mill is of uniform fineness and does not contain any coarse particles.

The slurry discharged from the Unidan mill flows through a concrete trough to a sump located under the correcting basins. Two No. 4 Wilfley centrifugal slurry pumps convey the slurry to the correcting basins. Each of the pumps has sufficient capacity to handle the output of the Unidan mill. The other is provided as a spare unit.

There are three correcting basins, each 20 ft. in diameter by 18 ft. deep. These tanks are of concrete construction, and are equipped with agitating machinery furnished by F. L. Smidth & Co. The slurry discharges by gravity from the correcting basins into an oval mixing basin 52 ft. long by 20 ft. wide by 21 ft. deep. It is also equipped with F. L. Smidth & Co. agitating machinery. The agitating machinery for each of these basins is operated by 25-h.p. motors operating through Pacific Gear and Tool Co.'s speed reducers.

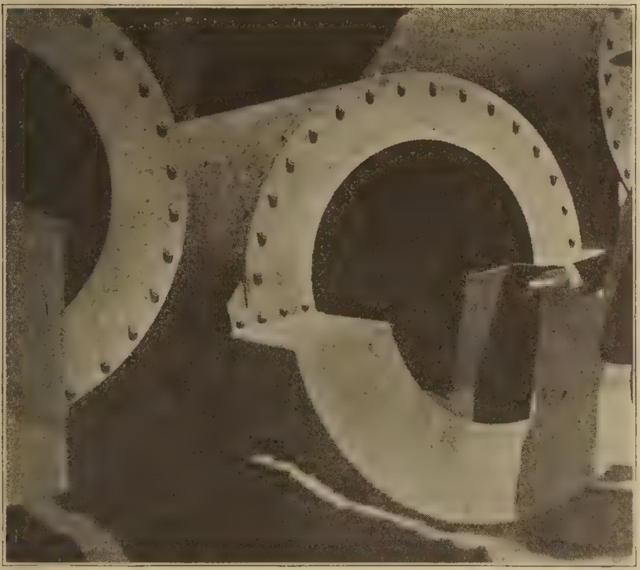


The Unidan mills, equipped with Symetro drives, ready to be installed

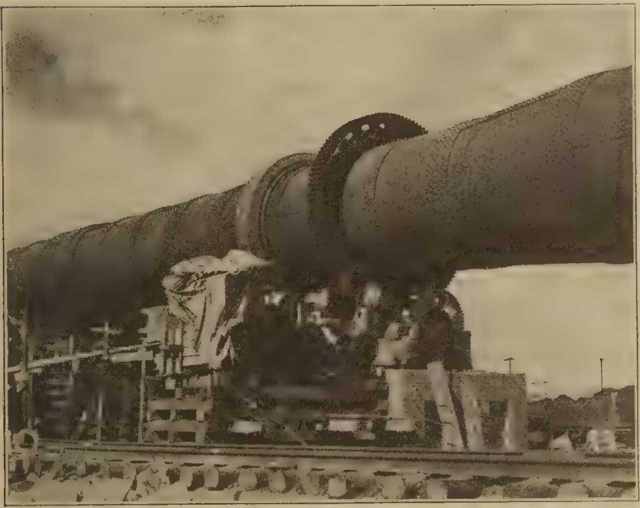
Slurry is discharged by gravity from the mixing basin into a large rectangular storage basin measuring 125 ft. long by 25 ft. wide by 21 ft. deep and having a capacity corresponding to about 7200 bbls. of clinker. The basin is equipped with an F. L. Smidth & Co. traveling agitator operated by one 5 h.p. and one 10 h.p. motor.

Two No. 4 Wilfley pumps are provided for bringing the slurry to the kiln feeder, one of which is held in reserve.

The kiln feeder is a Smidth special "S" type scoop feeder. The drive is by means of a special motor, normally operating at a speed being in a fixed relation to the speed of the kiln motor, covering the full speed range from no speed to full speed. This will insure a uniform loading of the kiln. The rate of feed can be varied over a wide range on both sides of the normal speed by means of a Stephens-Adamson speed changer. By this arrangement it is not only possible to take care of changes in water content and chemical changes of the slurry, but also to set the output of the kiln over a wide range, and still maintain the uniform loading of the kiln. The feeder is equipped with a speed indicator and revolution counter of the electrical remote indicating type with the instruments located on the master kiln control panel to be mentioned later.



Closeup of one end of the clinker coolers. Note the chains inside



The temporary motor for revolving the kiln while riveting. The kiln is so accurately balanced that a 100-h.p. motor will rotate it

At present, only one kiln will be installed. It is 343 ft. long and 11 ft. 3 in. and 10 ft. in diameter. The "wet" end of the kiln is equipped with F. L. Smidth & Co.'s patented chain system which greatly increases its calorific efficiency. The discharge end is equipped with an F. L. Smidth & Co.'s patented Unax cooler, single design. The cooler consists primarily of ten tubular sections each 40 in. in diameter, located concentrically around the discharge end of the kiln.

By this arrangement the ordinary cooler usually set below the kiln is entirely eliminated and as a consequence the kiln can be set from ten to twelve feet lower. This results in a very much lower cost of installation by savings in cost of buildings and foundations. The entire driving gear for the cooler is also eliminated resulting in a saving in power. The kiln proper was designed by F. L. Smidth & Co., and built by the Traylor Engineering and Manufacturing Co., whereas the Unax cooler, as well as the chain system for the kiln were furnished by F. L. Smidth & Co. The kiln is operated by an adjustable speed DC motor.

The fire brick lining for the kiln is furnished by General Refractories Co. The insulating bricks between the kiln shell and the fire brick lining for the calcining zone are Moler bricks, furnished by F. L. Smidth & Co.

The draft in the kiln is controlled by means of a 150-ft. high stack and two induced draft fans of special design, and direct coupled to adjustable speed DC motors. To reduce air leak between kiln and smoke chamber a special tightening device is provided. Both tightening device and steel smoke chamber are designed and furnished by F. L. Smidth & Co.

(To be continued)

Parent Company of Pacific Coast Cement Shows Lower Earnings

The holding company of the Pacific Coast Cement Company, the Pacific Coast Company, Seattle, Washington, shows earnings for the nine months ending September 30, 1928, of $10,944 after expenses. The total for the same item last year was $109,314. Total 1927 earnings are reported to have been $217,455.

This holding company owns the Pacific Coast Steamship Company, also Pacific Coast Engineering Company, and controls if it does not own outright the Pacific Coast Coal Company. It owns the Pacific Coal's dock in Portland, and is said to own some Portland city property; owns wharfage space in Seattle, Tacoma and Juneau; also extensive timber, coal and agricultural lands and considerable city property in other Northwest cities and Alaska.

The company has outstanding 7,000,000 shares of $100 par common, on which it did not earn a penny in 1927, and on which it has not paid dividends since 1921, when $1 was paid. In 1927 the company earned 29 cents a share on its 5 per cent non-cumulative preferred stock, and nothing on its 4 per cent non-cumulative second preferred.

New Northwestern States Officials Chosen

W. H. L. McCourtie of Jackson, Mich., was elected president of the Northwestern States Portland Cement Company at the annual meeting at Mason City, Iowa, on December 18th.

Col. Hanford MacNider of that city, former assistant secretary of war, and son of the late Chas. McNider, was chosen chairman of the board of directors.

Kentucky Project Going Ahead

No time is being lost in getting Kentucky's state-sponsored cement plant near Frankfort under way and machinery has been ordered and was due to arrive at the plant some time in December.

Cement Cartel in Europe Aims at United States Market

Huge Combine Plans to Undersell American Products in Absence of Tariff Restrictions

EUROPEAN combinations against the industrial supremacy of the United States are for the most part deep hidden in the offices of bankers. Now and then a clue is found which leads to revelation of one of these compacts.

One of these discoveries came while the writer was investigating the cement industry of Belgium and Luxemburg. Belgian cement is flowing into the United States in a great and increasing tide. It usually comes in duty free, as ballast. The resulting damage comes not only to American cement manufacturers and their employes, but also to the soft coal mines which supply the cement mills with fuel necessary for cement making. Every large shipment of foreign cement coming duty free to an American port dislocates the market at that particular point.

Continental Europe manufactures approximately 50 per cent more cement than it uses at home. It is this over-production that is the cause of the all-European cartel that has just come into being.

The corporate foundation of the gigantic combination is the Societe Continentale des Ciments, incorporated in Brussels, with a nominal capital of forty million francs. This comparatively small sum is a small fraction of the total involved in the cartel.

While details of territorial allocations, price-fixing and production limitations are kept from the public, it is known that competition with the big cement mills of the United States is the main objective.

That the cartel has real power in the United States is abundantly demonstrated by the ease with which efforts to safeguard American municipal contracts for domestic cement producers were defeated through political alliances with the cement importers.

While the cartel is domiciled in Belgium, its initial impetus came from Warsaw. Great plants which formerly were in Russian and Austrian territory are now sources of national wealth for Poland. It was to find an outlet for this Polish production that a conservation was arranged last June in Prague, which was attended by Austrian, Czechoslovakian, German, French, Italian, Spanish, British, Polish and Danish representatives of cement and financial interests.

Preparations had been made for the conversation by carefully guarded correspondence, and by understandings and arrangements between pairs and other groupings of the national participants. The war-born economic union of Belgium-Luxemburg and its international guardian, France, came to an agreement in December, 1927, whereby French territory was protected from invasion by the immense production of its neighbors.

Germany, desiring a free hand in Holland, which uses great quantities of cement annually, had made terms with Belgium-Luxemburg by which the Dutch nation was allotted to it in return for guarantees that Germany would not compete with Belgium-Luxemburg in North America.

The conservation in Prague, and its successors in Warsaw and Brussels, decided that European cement plants should be kept running at capacity for the purpose of reducing overhead expenses to a minimum, and that the over-production resulting from this policy—calculated conservatively at 50 per cent of the total output—should be marketed outside of Europe at cost or somewhat below.

It was argued that low-priced labor, absence of any American tariff, the subsidies given to European shipping by various countries, and the unification of sales force and sales policy as contrasted with high American wages, the lack of American ships and the handicapping of American manufacturers by American work standards, would enable the all-European cement cartel not only to undersell American cement in South America, but also to invade the United States itself.

The importance of this combination is understood by those who see the industralized world of tomorrow with concrete and steel structures fretting the skyline of every large city, with concrete highways weaving gigantic webs for the rapidly increasing motor traffic of all nations, with docks and dams and dikes for harbors and waterways demanding millions of tons of cement, and the new uses opening daily for this industrial necessity.

The United States has been in the forefront of this industry. If it shall fail to protect American plants and American cement workers by an adequate tariff, it will soon lose that leadership. European industrialists and financiers are fully awake to their opportunity. In every country where cement-making is possible, large and improved plants are being established. The great, new Danish mills, the huge establishments that have recently come into being in Germany, France, Poland, Luxemburg and Czechoslovakia are examples.

Cement is not the only product of Belgium which competes with American basic output. Iron, steel, coal, textiles and ceramics are high on the competitive list. The Belgian workman is one of the poorest paid in the world. Rated in the world-index of real wages, with London fixed at the 100 mark, the workman of Brussels is rated at 46, as compared with the Philadelphia worker's real wage mark of 192.

As explained in a previous article, real wages are computed upon the number of basketfuls of certain standardized provisions the weekly wage of a worker in a specified city will purchase. The world-index is prepared by the statistical section of the League of Nations. Philadelphia, as America's outstanding industrial city, has been chosen to represent the United States.

Not only are wages low in Belgium and Luxemburg in all the industrials, but living and working conditions are so far below the standards demanded by American workers that comparison is impossible. American men and women simply would not compete upon a basis which would deny children the educational advantages now obtainable everywhere in this country, which would take from American women the measure of economic independence they have achieved, which would again widen the gulf between capital and labor, and bring Communism as the only goal toward which the workers could travel.

—From the *Philadelphia Inquirer*

EDITORIAL

Balancing Production and Demand

IN business, as well as in every other department of life, there are certain inexorable laws that operate regardless of what you or I may think of them. If we conduct our lives and our businesses in harmony with these laws, the results are favorable. If we go counter to these laws, the results are harmful.

One of these fundamental laws is that of supply and demand. No matter how much cement is produced, the market will use only as much as it requires and no more. It is unfortunate that at the present time the market will not consume as much cement as the cement mills in the United States turn out month after month and year after year. Yet such is the fact—and it is this fact that is responsible for most of the ills that, according to cement manufacturers, afflict the industry and take the joy out of life.

It seems trite to say, "If that is the case, why produce more cement than is needed?" And yet it is in a trite statement like this that the remedy to the situation may lie.

Manufacturers have long held the opinion that in order to operate economically, it is necessary to operate at, or near, full capacity. Ordinarily—if we do not consider the statement above—this is true in the cement industry as in other industries. But if it is necessary to suffer a greater loss by operating near capacity than is suffered by not operating at, or near, full capacity, then it is the part of wisdom to choose the lesser of the two evils.

An examination of the cement production and consumption statistics from this point of view is interesting and may be helpful. Especially is this true when the selling price is also considered. Taking for comparison the nine Eastern and Middle Western districts, as reported by the U. S. Bureau of Mines statistics, we have:

Year	Production (bbls.)	Shipments (bbls.)	Average Mill Price
1923	120,900,000	119,600,000	$1.84
1924	132,300,000	129,200,000	1.75
1925	142,700,000	138,400,000	1.73
1926	145,000,000	143,000,000	1.68
1927	152,900,000	151,500,000	1.58
Total	693,800,000	681,700,000	

Summing up these statistics, we have, by subtracting the shipments of 681,700,000 barrels from the 693,800,000 barrels produced, an excess production for this territory of 12,100,000 barrels, or only 1¾ per cent. During this period, the average mill price per barrel of cement dropped from $1.84 in 1923 to $1.58 in 1927, and the average price for 1928 will be still lower.

Perhaps it is not entirely fair to attribute the decline in selling price entirely to that 1¾ per cent of overproduction. Other factors undoubtedly entered in to influence the downward trend of prices, but excess production was certainly one of the most important of the influences.

Few will dispute the statement that it is the scramble caused by the small margin of overproduction that is the cause for the price cutting and other practices that have been so harmful during the past few years. As has been pointed out in a previous editorial, it is the scramble to sell this small additional production that raises sales costs to the point where they almost cancel any profits that may have been made on the normal sales.

Certainly, manufacturing costs are not so greatly reduced by virtue of adding this extra 1¾ per cent of production. And that brings us back to the beginning of this editorial where the statement was made that it is the part of wisdom to choose the lesser of the two evils. Any manufacturer can compute, from an analysis of his sales prices during the past few years and his knowledge of manufacturing costs, just what this 1¾ per cent excess production has cost him.

A Protective Tariff for Cement

ENLARGED usefulness of the Tariff Commission by making it a more practical and useful body for Congress is seen in the effort being made to "take politics out of the tariff." A sub-committee of the National Conference on Tariff Adjustment has been brought together under the auspices of the National Association of Manufacturers to confer with the House Ways and Means Committee and the Senate Finance Committee in an effort to bring about an equable adjustment of the tariff as it applies to present conditions.

The Ways and Means Committee is setting out to do a large amount of preliminary investigation. A schedule of hearings running all through the present session of Congress is already under way, in an effort to be prepared to introduce a tariff revision bill in an April or May session of Congress, if it is called. But even if such a session is called, it is the opinion of experts that a new tariff law will not be enacted before 1930.

These new activities in behalf of a revision of the tariff, promise a favorable consideration of the effort to put a protective tariff on cement. Under the present plans, the opinions of experts in each industry will bear much weight and the carefully worked out case of the cement industry should undoubtedly result in an adjustment that will benefit the industry.

Dealers Act to Retain Cement Distribution

The twenty-ninth annual convention of the National Builders Supply Association was held at Memphis, Tenn., December 3rd to 5th. Among the reports of commodity committees presented was that by the cement group, of which B. J. Mitchell, Niagara Falls, N. Y., is chairman. It follows in full.

"The work of your Cement Committee this year is a continuation of its 1927 activities, which culminated last fall at our annual convention when we, with the help of practically every state and district organization, were able to convince the different cement companies that their plan of distributing a large portion of their product direct to different interests and eliminating the building supply dealer, except in smaller operations, was a mistake and would be resented by over 25,000 dealers scattered all over the United States. In simple justice I might add that if we had not had the support of several of our largest and best managed companies, it would have taken much longer to have accomplished our purpose. But we would have won out on our plan eventually because it was not only economically sound but was, and is, the logical channel for distribution of this great product.

"This year we of the Cement Committee have been cleaning up after last fall's fracas. We have investigated a very large number of differences between manufacturers on one hand and dealers on the other. In some of these cases the manufacturer deliberately set out to take certain jobs without regard to the dealer, or dealers, in a certain locality, *and took them*, their very flimsy excuse being that if they did not take them some other cement company would. Isn't this a fine excuse for a supposedly high-class man to make to his superiors and expect to get away with it? A large number of cases up for investigation were the result of misunderstanding, principally brought about by the salesman telling his sales manager that some other company had made a lower price and he lost the job, simply providing this alibi for himself for falling down and not getting the order. Maybe he never went near the contractor at all and he had to have some excuse. *These cases have happened.*

"We have found in the later months this year that the manufacturers, we really believe, are definitely trying to build up their distribution around the dealer. If they had all the good dealers they wanted there would not be any trouble.

"Now for the dealers—we have a lot of good ones, we have some medium ones and a few not so good. The dealer who allows a salesman to put a job through him, and pay him for the use of his name, the said dealer performing no service, is not entiled to one cent, and should not be allowed to continue a member of our association. He is the most destructive element with which we have to deal. A dealer must be able to say, 'No,' and he must be ethical if he wishes the manufacturer to be ethical and say, 'No." Your Cement Committee has endeavored to be fair and impartial; we have not been picayunish; we have passed over trivial cases, and frequently a telephone call and a pleasant word has straightened out what looked like a nasty situation. The manufacturers are not all lily white, neither are the dealers all lily white. In my judgment the dealer is just as essential to the manufacturer as the manufacturer is essential to the dealer.

"I believe our progress this year has been marked. I know our relations with the manufacturers have never been more cordial and pleasant than at the present time. I earnestly believe that we are on the right track and if we treat each other fairly, and our friends, the manufacturers fairly, we will find that more and more their distribution will be through the dealer.

"The following is the plan we are pursuing in making these investigations:

"1. All complaints should be sent to Mr. Dunning for investigation and report.

"2. When Mr. Dunning receives a complaint against any cement company he is to furnish the Chairman of the Cement Committee with a copy of this complaint, stating when his investigation will start.

"3. Mr. Dunning is to make investigation through the state and district associations, or such other means as may be available.

"4. Mr. Dunning to get a statement from the manufacturer giving their side of the controversy.

"5. When investigation has been completed Mr. Dunning will forward all papers pertaining thereto, together with his comments and recommendations on same, to the Chairman of the Cement Committee.

"6. Chairman of the Cement Committee will make a decision in all ordinary cases.

"7. In cases involving a question of policy the Chairman of the Cement Committee will consult with the President of our association for such action as he and the Directors may deem advisable."

Bessemer Co-operates with Council in Safety Meet

In co-operation with the Western Pennsylvania safety council in its November drive for a reduction of industrial accidents, the plant of the Bessemer Limestone and Cement Company held a safety rally in the local high school on November 20th. Jas. A. Kilty of Pittsburgh was the speaker. A. J. Eales of the Bessemer was in charge.

Seek to Erect Mountain Park Plant Near Los Angeles

Violent opposition is being met by the Los Angeles Mountain Park Company's proposal to work a quarry cement in the Santa Monica mountains to supply a proposed cement plant. Backers of the plan have filed a request with the War Department to grant permission for the project and a pipeline right of way in Santa Monica Bay, which it is assured, will not interfere with shipping.

The project was definitely rejected by the city planning commission and the city council several months ago. It has since been revised to include the pipeline to convey limestone blasted free from the Santa Monica Mountains to barges.

Protests have been made against the proposed project on the assumption that if one industry is admitted to the palisades zone, more will follow, which will result in lowered residential property values.

Milton C. Gardner, representing the cement company, has given assurance that the manufacturing plant will not be within 30 miles of the quarries.

He is also quoted as saying that his company is so sure of the workability of the plan now proposed that they are prepared to spend $2,500,000 in advance for pipeline, vessels and a manufacturing plant. He declared the nearest present residence of the proposed crusher site is 2.8 miles distant, the nearest privately owned land, 1.5 miles.

Property owners in this district, however, are almost united in their opposition to the proposal and have taken various steps to prevent it.

It is also admitted to be likely that the harbor district of San Pedro might furnish a site for the plant.

A Graphic Method of Proportioning the Raw Mix

A Report of the Research Institute of the Slag Cement Industry, Dusseldorf, Presenting Graphical Methods of Proportioning Raw Materials, Particularly for High Early Strength Cements

By DR. RICHARD GRUN and DR. GUNTHER KUNZE

AUSTRIA was the cradle of high early strength cement. As early as in 1915 Spindel[1] pointed out the possibility of manufacturing high early strength cements, and this cement was in actual use during the war in bridge building carried on by the Austrian war department. Following the war, the manufacture of high early strength cements was taken up in Switzerland (Holderbank) as well, and this cement together with the new high alumina cement was shipped to all parts of Germany. At first the opinion predominated that high early strength cements imported from other countries presented no advantage over the German cements, and it was held that standard German cements reached strengths equally as high as did the high early strength cements.[2] [3] This claim lost out, however, in view of the undeniably superior compression strength of high early strength cement. Thereupon the German cement industry began manufacturing high early strength cements and today makes these cements of such quality, that all competition with other countries is ruled out.

Graphic Reproduction of Cement Analysis

The causes of the high qualities of a portland cement, i. e., of its high initial strength, were first looked for only in careful preparation of raw materials, thorough and strong calcination and fine grinding of the clinker. However, it was soon realized, that aside from these natural prerequisites of high initial strength of cement, the chemical composition of the clinker was also of great importance.

In the slag cement industry, Passow was first to point out the importance of chemical composition of the clinker and to require that the chemical composition of the clinker conform to the slag used.

Starting out with the assumption that, aside from fine grinding, etc., the chemical composition of portland cement clinker for high early strength cements should receive special consideration, analyses were made in the Research Institute in 1924 of a dozen high early strength cements, which were obtainable at the time with some difficulty, as few were manufactured as yet. Among these were the brands Holderbank, Thayngen, Gmunden, Grandchamp, Slite, Stramberg and other foreign products.[4]

These cements were analyzed and the results platted in the familiar tri-axial diagrams, which were to give a common criterion for all cements. The procedure proved unsuccessful until Gun's[5] method of treating alumina cements by splitting them up into the individual silicates and aluminates was also applied here.

In accordance with Rankin's[6] suggestion, who claims that a good cement requires a specially high tricalcium-silicate content, the selected components were: tricalcium-silicate, dicalcium-silicate, tricalcium-aluminate and dicalcium-ferrite. A graphic method of computation, worked out in collaboration with Dipl. Ing. Tremmel, permitted a rapid determination of the proportions of the raw mix.

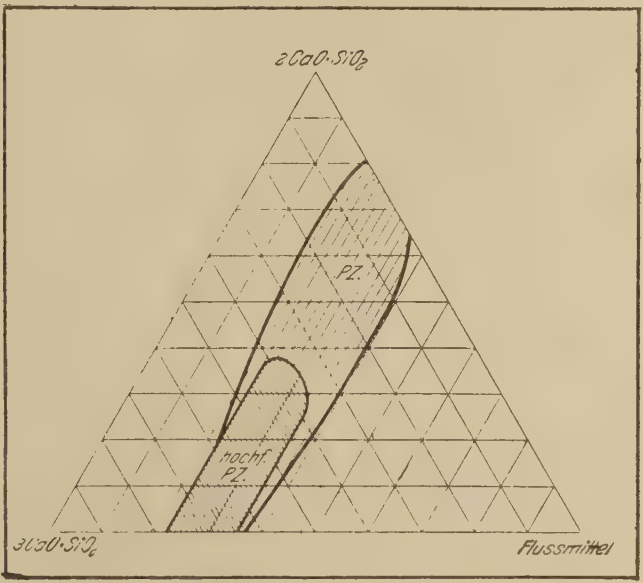


Fig. 1. Zones of portland cement and high early strength portland cement in the three-component system: $2CaO.SiO_2$ — $3CaO.SiO_2$ — *flux*

The evaluation of cement analyses showed that cements with a high tricalcium-silicate content actually yielded the highest strengths, and comparison of the clinker resulted in establishing within the familiar portland cement area a narrowly limited field of high early strength portland cements, as reproduced in Fig. 1. The latter is a tri-axial diagram, whose lower left hand angle represents pure tricalcium-silicate, the lower right hand angle the fluxing material and the apex—pure dicalcium-silicate, while the sides are graduated to 100 per cent.

The method of computation described here has been substantiated by its use as a working hypothesis for over three years. An unsatisfactory point in the graphic method remained the wholesale designation by "fluxing material" applied to the two important components, tricalcium-aluminate and dicalcium-ferrite, together with all remaining components, such as gypsum, magnesia, etc. It was

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Translated from *Zement*, Aug. 2 and Aug. 9, 1928.

[1] Spindel, Osterr. Wochenschrift f. d. offentl. Baudienst 21, No. 41, 1915; *Tonindustrie-Zeit.*, 1919, p. 1125.

[2] Endell, *Zement*, 1920, p. 25.

[3] Framm, *Zement*, 1920, p. 541 and 577.

[4] Grun, *Der Beton*, p. 16-18.

[5] Grun, *Tonindustrie-Zeit.*, 1924, p. 249.

[6] Rankin, Session of the Faraday Society, London, 1918.

desirable to work out a diagram showing all of the clinker components. This can be accomplished by using, instead of the equilateral tri-axial diagram shown in Fig. 1, one with a right angle and equal adjacent sides.[7] Fig. 2 shows that the latter diagram permits the platting of any number of components.

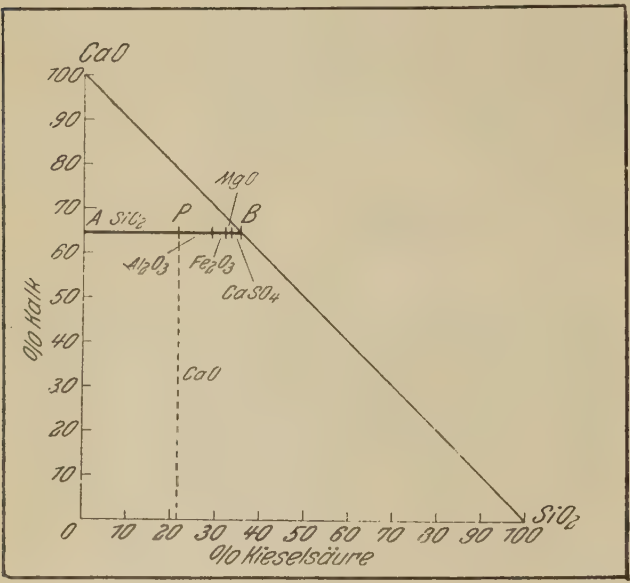

Fig. 2. Triangle with right angle and equal adjacent sides for platting the gross analysis of portland cement

As an example, a portland cement is platted of following composition:

	Per Cent
Silica	21.5
Alumina	7.8
Iron oxide	2.8
Lime	64.5
Magnesia	1.4
Gypsum	2.0
	100.0

The lime content of 64.5 per cent is platted first along the ordinate; a line parallel to the abscissa is drawn at 64.5 per cent and the other components are platted along it in the following assumed order: silica, alumina, iron oxide, magnesia and gypsum. The straight line AB gives the composition of the cement. In characterizing a cement it is frequently sufficient to designate point *P* (Fig. 3).

It is equally advisable here to reduce the analysis to the individual clinker forming components, instead of platting the gross analysis. It is not necessary to make a complete computation; a slight change of the analysis is sufficient. This is illustrated in Fig. 4 for the above cement.

The quantities of lime required for the formation of tricalcium aluminate and dicalcium-ferrite are subtracted from the total lime content. These quantities are computed as follows:

7.8 per cent Al_2O_3 combine in the form of

$$3CaO\,.\,Al_2O_3\ \frac{7.8\,.\,3CaO}{Al_2O_3} = 7.8\,.\,1.65 = 12.87 \text{ per cent } CaO$$

2.8 per cent Fe_2O_3 combine in the form of

$$2CaO\,.\,Fe_2O_3\ \frac{2.8\,.\,2CaO}{Fe_2O_3} = 2.8\,.\,0.7 = 1.96 \text{ per cent } CaO$$

This quantity of lime, not available for the formation of tricalcium-silicate and dicalcium-silicate, is subtracted from 64.5 per cent, as follows: 64.5 per cent (total lime) — 14.83 per cent (lime combining with Al_2O_3 and Fe_2O_3) = 49.67 per cent (available lime).

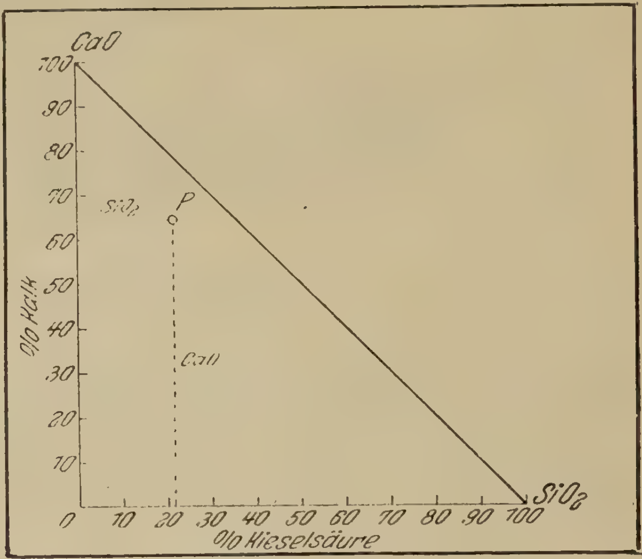

Fig. 3. Triangle with right angle and equal adjacent sides for plotting the lime and silica contents of a portland cement

The 49.67 per cent available lime is platted in Fig. 4 instead of the total lime content, i. e., a line parallel to the abscissa is drawn at 49.67 per cent CaO and on this line are platted successively the silica content of 21.05 per cent, then the tricalcium-aluminate (7.80 per cent plus 12.87 per cent minus 20.67 per cent) and dicalcium-ferrite (2.80 per cent plus 1.96 per cent equal 4.76 per cent), followed by the remaining components. The tricalcium- and dicalcium-silicate contents may be read off the diagram directly, providing proper co-ordinates are selected:

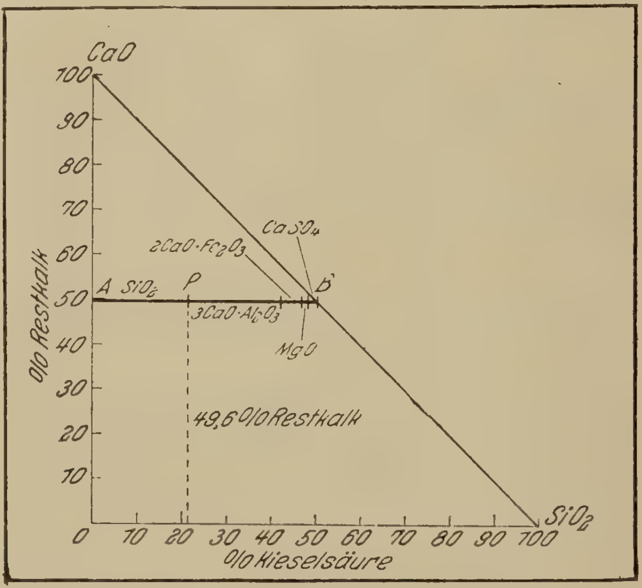

Fig. 4. Triangle with right angle and equal adjacent sides with a portland cement plotted according to its clinker forming components

As the hypothenuse of a right triangle is the geometric location of all compounds consisting only of lime and silica, tricalcium- and dicalcium-silicate are also located along this line. Fig. 5 shows the platted values of tricalcium- and dicalcium-silicate; the range between these two points is filled by compounds consisting of tricalcium- and dicalcium-silicate only. In the inner part of the triangle are located compounds which contain, aside from tricalcium- and dicalcium-silicate other "fluxing materials," whose content increases with the distance from the hypothenuse. The "theoretical unsoundness limit" of a cement is accordingly the line connecting the tricalcium-silicate with the origin of the system of co-ordinates.

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[7] Compare Kuhl-Knothe, Die Chemie der Hydr. Bindemittel, p. 99. Lodocnikow, Zeitschr. anorg. Chemie, 151, 1926, p. 185. The parallelogram suggested recently by Spindel (*Tonindustrie-Zeit.* Anniv. Issue 1926, p. 53) is based on the same principle.

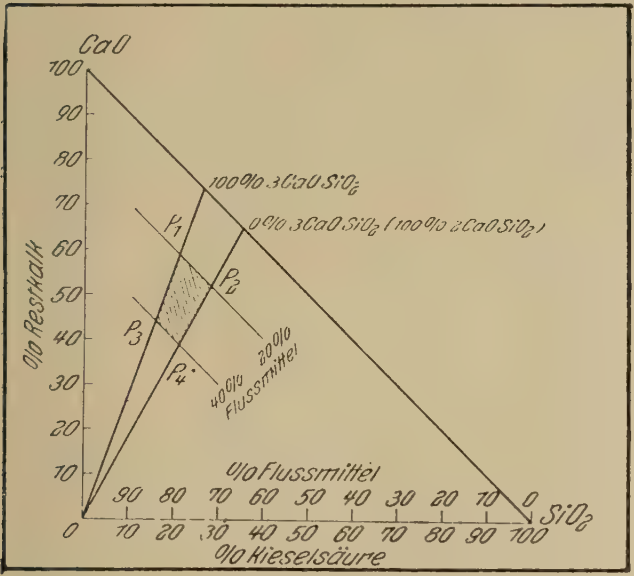

Fig. 5. Method of reading values of $3CaO.SiO_2$ and $2CaO.SiO_2$ content

This line is the geometric location of all compounds, in which all of the silica is present in the form of tricalcium-silicate, i. e., aside from the flux content, these compounds contain only tricalcium-silicate with no dicalcium-silicate present. This theoretical limit of unsoundness is never reached in practice. In the manufacture of clinker, the lime content can be increased only up to 2.5 to 2.7 calcium-silicate, as clinkers with higher tricalcium-silicate content develop unsoundness.[8]

In accordance with this experimental evidence, a practical soundness limit might be indicated. However, this was not done as test conditions are still known to influence the soundness test to a large extent, and because the constitution problem is still far from solved.

Correspondingly, a line connecting the dicalcium-silicate with the origin is the geometric location of all compounds, containing only dicalcium-silicate, aside from the flux, and in which no tricalcium-silicate is present. Fig. 6 represents a section of Fig. 5, in which the tricalcium-silicate division is also shown, namely, the area P_1, P_2, P_3 and P_4. As the line $P_1 - P_2$ corresponds to a flux content of 20 per cent, thus leaving only 100 minus 20 equals 80 per cent for tricalcium- and dicalcium-silicate, it is subdivided into 80 parts. Along the line $P_5 - P_6$, corresponding to 30 per cent flux, only 70 per cent is available for the sum of the two silicates, so that this line is divided into 70 parts, while the line $P_3 - P_4$ with 40 per cent flux is divided into 60 parts. In platting points inside the parallelogram thus formed, the tricalcium- and dicalcium-silicate content may be read off Fig. 6 directly.

Thus, point P_1 corresponds to a compound of 20 per cent flux and 80 per cent tricalcium-silicate, point P_2 to 20 per cent flux and 80 per cent dicalcium-silicate, while point P^7 represents a composition of:

Per Cent
30 flux
40 tricalcium-silicate
30 dicalcium-silicate (equals difference from 100 per cent)
100 per cent.

It should be emphasized again, that this computation makes no pretense at analyzing the actual clinker components, which to this day are known with little certainty; it is to be applied as a working hypothesis, which has proven adequate through years of previous use.

Application of Diagrams

In accordance with the new graphic method, Fig. 7 shows numerous commercial high early strength cements,

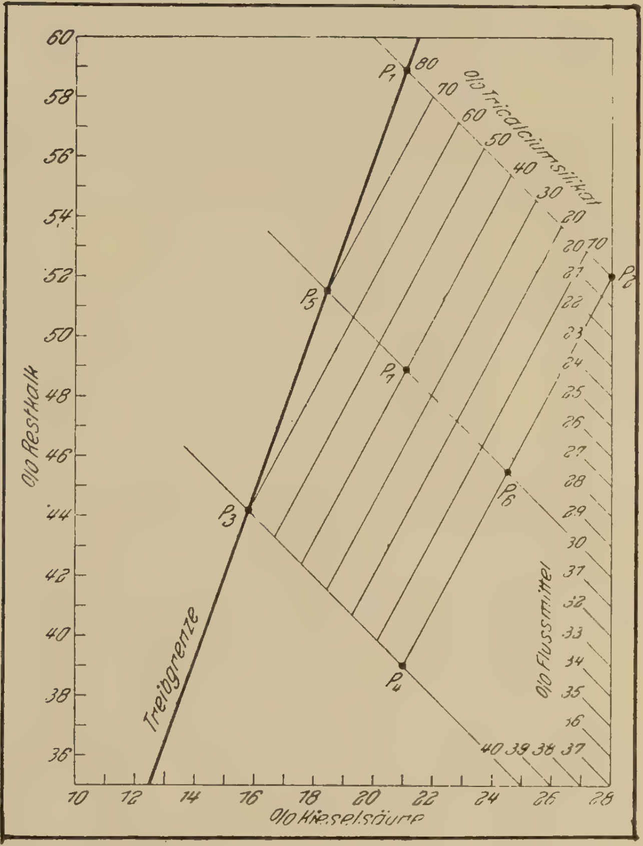

Fig. 6. Section of Fig. 5: read off values of flux, tri- and dicalcium silicate in per cent

together with such cements calcined in the Research Institute. In all computations the gypsum content is eliminated, as the gypsum, added subsequent to calcination, has no relation to the constitution of the clinker. The table shows that the chemical composition of the high early strength cements falls within the range 22 to 35 per cent flux and 30 to 70 per cent tricalcium-silicate. Ordinary portland cements can show even greater variation in composition. It is understood that many ordinary portland cements lie within the indicated range, as the high early strength properties depend not only on chemical composition, but also on the degree to which the reactions are carried in the raw mix, on careful preparation of materials, strong calcination, etc.

The empirical indices used thus far, as the hydraulic modulus and the silicate modulus, were purposely left out of consideration. In place of the hydraulic modulus, the diagram gives the distance from the soundness limit, which indicates the relative lime content with greater accuracy than the hydraulic modulus. In place of the silicate modulus, the values of the silica content can be read off the diagram, the same being true of the aluminate and ferrite content.

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[8] Tremmel, *Zement*, 1927, 329.

Graphic Method of Proportioning the Raw Mix

As the manufacture of high strength cements, whether portland or slag cements, requires very accurate proportioning of the raw mix, whose chemical composition is of utmost moment in determining the high strength qualities of a cement, correct proportioning of the raw mix is of great importance today. A simple mixing of accidentally available raw materials in the ratio corresponding to the practical soundness limit, is no longer sufficient in many cases. The use of a certain hydraulic modulus or the proportioning of the mix for all cases, where more than two components are present in the raw mix, is extremely laborious, when numerical determination is adhered to, consuming much time.[9] [10] [11]

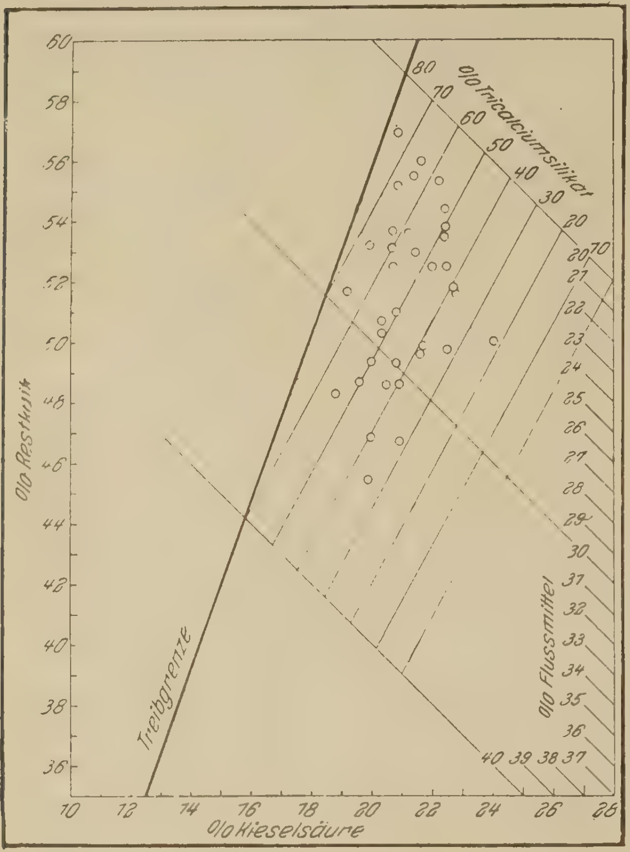

Fig. 7. Position of various high early strength cements in the new three-component system: tricalcium silicate—dicalcium silicate—flux

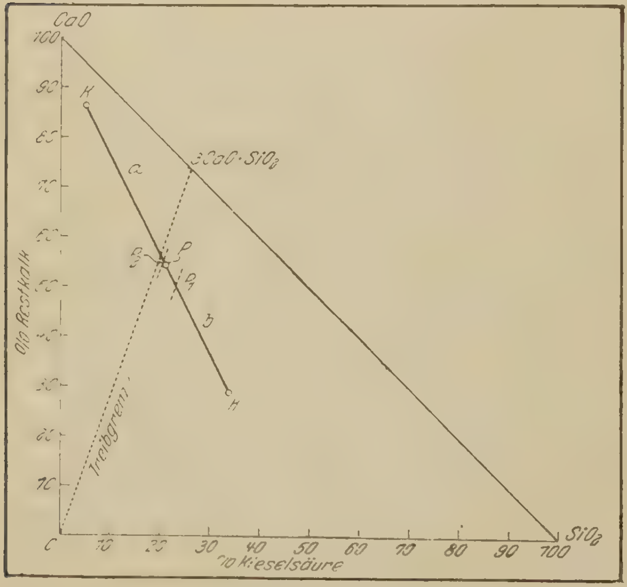

Fig. 8. Graphic determination of raw mix proportions for two components

Much simpler, easier and more time-saving are graphic methods, which are just as accurate as the numerical methods. The graphic method based on the clinker analysis described above will be illustrated in the following.

Proportioning of Two Components

The raw mix is to consist of blast furnace slag H and limestone K of composition given below:

	Slag H Per Cent	Upon Ignition Per Cent
SiO_2	33.16	33.92
Al_2O_3	9.10	9.31
Fe_2O_3*	4.62	4.73
MnO	0.18	0.18
CaO	46.55	47.61
MgO	4.16	4.25
Remainder (sulfur, loss on ign., etc.)	2.23	———
	100.00	100.00

*Computed from FeO.

The following reactions take place:

9.31 per cent Al_2O_3 $1.65 \,.\, 9.31 = 15.36$ per cent CaO.
4.73 per cent Fe_2O_3 $0.7 \,.\, 4.73 = 3.31$ per cent CaO
15.36 per cent $+ 3.31$ per cent $= 18.67$ per cent CaO.

A total of 18.67 per cent CaO combines in the reaction; the available lime is:

$$47.61 - 18.67 = 28.94 \text{ per cent.}$$

	Limestone Per Cent	Upon Ignition Per Cent
SiO_2	3.00	5.09
Al_2O_3	0.80	1.36
Fe_2O_3	0.32	0.54
CaO	52.40	88.81
MgO	2.48	4.20
Rem.	41.00	———
	100.00	100.00

Per Cent CaO
1.36 per cent Al_2O_3 combine $1.65 \,.\, 1.36 = 2.24$
0.54 per cent Fe_2O_3 combine $0.7 \,.\, 0.54 \quad = 0.38$
2.62

Remaining lime, 88.81 per cent — 2.62 per cent = 86.19 per cent.

The two raw materials are platted respectively with coordinates corresponding to 33.92 per cent SiO_2 and 28.94 per cent remaining lime and to 5.09 per cent SiO_2 and 86.19 per cent remaining lime (Fig. 8). The line connecting these two points H and K is the geometric location of all combinations possible with these two components. The method of approach in the graphic method differs from that of the customary moduli computations through the omission of the "lime limit," the hydraulic modulus, etc. Fig. 7 shows that all useful clinkers fall between the limits P_1 and P_2. As, all other conditions being equal, the strength increases with the lime content, an effort is made to bring the clinker as close as possible to the practical soundness limit, for example point P. To obtain a clinker of this composition, read or scale off the distances KP and PH and combine KP $= a$ parts of slag H with Ph $= b$ parts of limestone K (both computed without loss on ignition).

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[9] Nitzsche, *Zement*, 1926, 352.
[10] Gille, *Tonindustrie-Zeit.*, 1927, 1477.
[11] Helmholtz, *Zement*, 1927, 1092.

$a = 7.1$ parts (read on the original)

$b = 5.7$ parts

The original quantities including the loss on ignition are:

$$a = \frac{7.1}{100 - 2.23} = 7.26 \text{ parts}$$

$$b = \frac{5.7}{100 - 41.0} = 9.66 \text{ parts}$$

The required composition of the raw mix, therefore, is: One part slag to 1.33 parts limestone or 42.91 per cent slag to 57.09 per cent limestone. This raw mix yields a clinker of following computed composition:

	Per Cent		Per Cent CaO
SiO_2	21.08		
Al_2O_3	5.77	combine with	9.52
Fe_2O_3	2.86	combine with	2.00
MnO	0.10		Per Cent
CaO	65.96	remaining lime	65.96
MgO	4.23		— 11.52
	100.00		54.44

The clinker corresponds exactly with point P.

Should the analysis of clinker show considerable quantities of free lime, a remedy is sought in greater fineness of the raw mix and stronger calcination. If this is not possible, the composition of the raw mix must be changed from point P in the direction of Point P_1. On the other hand, when the clinker is sound from the start, the composition of the raw mix is changed in the direction of P_2, bringing the lime content as close as possible to the actual soundness limit. If a satisfactory clinker cannot be obtained in any way (low strengths, quick set, slow-setting, etc.), further components must be introduced and, according to the desired results, the SiO_2, Al_2O_3 or Fe_2O_3 content varied.

Proportioning of Three Components

The following raw materials are available:

	Limestone K Per Cent	Upon Igni. Per Cent		Per Cent CaO
SiO_2	3.6	6.22		
Al_2O_3	0.4	0.69	Combine with	1.14
Fe_2O_3	0.9	1.55	Combine with	1.09
CaO	51.5	88.95		Per Cent
MgO	1.5	2.59	Remaining lime	88.95
Rem.	42.1	-----		— 2.33
	100.0	100.00		86.72
	Clay T Per Cent	Per Cent		Per Cent CaO
SiO_2	31.4	35.7		
Al_2O_3	26.4	30.0	Combine with	49.5
Fe_2O_3	7.4	8.4	Combine with	5.9
CaO	22.0	25.0		Per Cent
MgO	0.8	0.9	Remaining lime	25.0
Rem.	12.0	----		— 55.4
	100.0	100.0		— 30.4
	Sand S Per Cent	Per Cent		Per Cent CaO
SiO_2	96.4	98.2		
Al_2O_3	0.5	0.5	Combine with	0.825
Fe_2O_3	1.3	1.3	Combine with	0.910
Rem.	1.8	----		
	100.0	100.0	Remain. lime =	— 1.735

These raw materials are platted in Fig. 9. It may be observed at a glance that the line K — T does not come in contact with the cement area, which means that it would be useless to look for correct proportions of a raw mix made of the limestone and clay alone.

The diagram also makes it evident that there should be a correction made with an admixture of silica. If P is the desired clinker, a line SP is drawn to the intersection M with the line KT. We then mix as follows:

a parts T	$a = 6.8$ (12)
b parts K	$b = 17.4$ (12)

and obtain $a + b$ parts (T + K) corresponding to point M. In the mixture M we have

d parts M	$d = 18.8$ (12)

with

c parts S	$c = 1.14$ (12)

which, mixed together, correspond to point P. Altogether the mixture should contain:

$a = 6.8$ parts T (upon ignition)

$b = 17.4$ parts K (upon ignition)

$$c/d\ (a + b) = \frac{24.2 \ .\ 1.4}{18.8} = 1.8 \text{ parts S}$$

or, computed for original materials before ignition:

$$\frac{6.8}{100 - 12} = 7.73 \text{ parts T}$$

$$\frac{17.4}{100 - 42.1} = 30.05 \text{ parts K}$$

$$\frac{1.8}{100 - 1.8} = 1.83 \text{ parts S}$$

The proportions of the raw mix should be: 1 part clay to 3.9 parts limestone to 0.24 parts sand; or 19.46 per cent clay, 75.88 per cent limestone, and 4.66 per cent

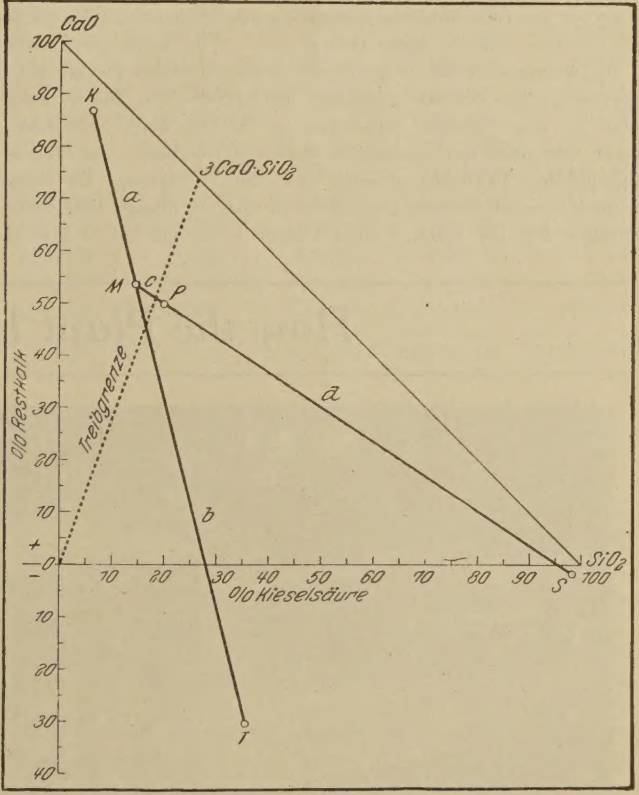

Fig. 9. Graphic determination of raw mix proportions for three components

(Concluded on page 124)

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[12] May be read off on the original in centimeters.

MEN and MILLS

Notes from the Field

Dwight Morgan Elected Member of New Ad Board

Dwight Morgan, vice president of the Virginia Portland Cement Corporation was elected a member of the new advertising board of the Norfolk-Portsmouth (Va.) Chamber of Commerce.

Marquette Cement Manufacturing Company Offers to Spare Bailey's Falls

Chapters of the Izaak Walton League at Mendota, Ottawa, Peru, Oglesby, Englewood, Streator and Marseilles were represented recently at a meeting held at the Hotel Peru to consider the recent Marquette Cement Company's proposal to dedicate the acreage surrounding Bailey's Falls, Ill., for a public park.

Bailey's Falls, situated on the Vermillion river, south of Oglesby, is one of the beauty sports of LaSalle County. The operations of the cement mills threatened to wipe out the falls until the company made its generous offer to spare them.

In turning over the property for public purposes, the cement company officials plan to close certain roads and at the same time open new avenues of access to the public. Township officials have concerned themselves with this phase of the question but the Izaak Walton League is dealing only with the protection of the stream in that region which makes the Falls. They also aim to protect the natural beauty of the grounds.—*Princeton, (Ill.) Republican.*

Penn-Dixie Finds Talent in Unsuspected Quarters

Our organization, says the Penn-Dixie Doings, like all others, has occasions to look over its employees to see what talent it can find. Sometimes this talent just crops out, but at other times it must be coaxed. Heretofore we have found musicians, dancers, songsters and athletes for most every sport, and just as we think we are "sitting pretty" as far as entertainment is concerned, here crops out one of our salesmen in a brand new role.

Our southern Alabama representative, Senor West, heretofore known as Chas. D. West, has proven himself to be a first-class Toreador. On October 31st, Senor West encountered a full grown "Bull" on a highway just outside of DeFuniak Springs, Florida. Senor West was never one to turn his back when there's trouble ahead, so he takes his little Buick and rams the big old "Bull" right in the head. Now folks, that's all there is to it; the "Bull" was dead and Senor West had to have his Buick hauled to DeFuniak Springs for repairs. It does seem a pity though that all of us could not have been present to give three big "Bravos."

Cement Mergers Reported as Probable

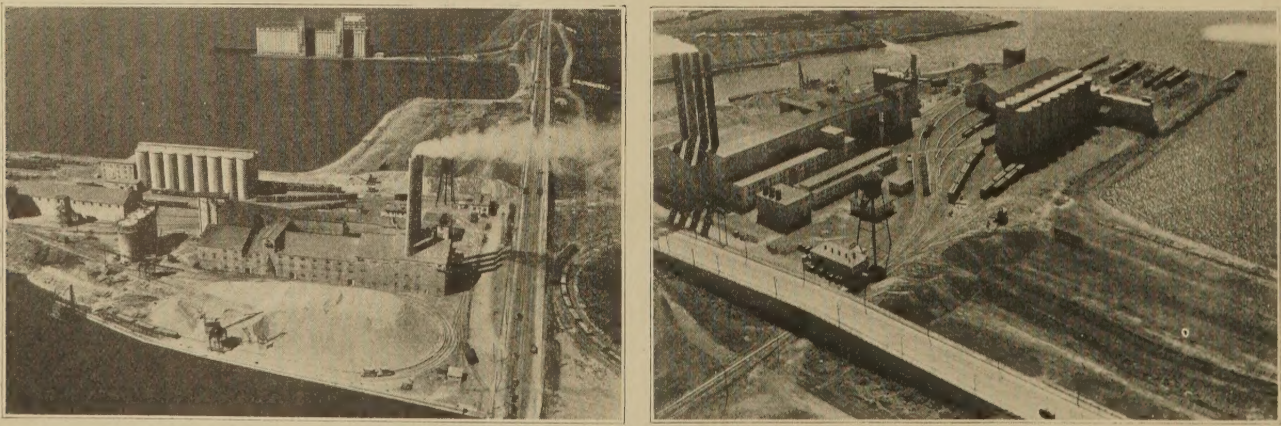
A realignment of various units in the cement industry through consolidation is viewed as a logical probability by the investment banking firm of Wood, Struthers & Co., which recently completed a study of the industry. The merging of present independent companies, the report points out, would be in line with the trend in other major industries.

"At present," the report says, "there is no one company which has more than twenty plants or produces more than 12 per cent of the total output. The combined production of the six largest companies does not even equal half of the total. If one compares this situation with that obtaining today in the steel, electrical or motor industries, some conception of the possibilities in this direction may be visualized."—*Chicago Tribune*

Ideal Cement Company's Luck Hangs On

Having uncovered all the natural gas it requires for its Ada, Oklahoma, cement mill, and an oil well that more than paid for the expense of drilling all the wells, four in all, the Ideal Cement Company has agreed with the Transcontinental Oil Company to permit drilling on its land in Ellis county, Kansas, where an oil well has been struck.—*Special Correspondence.*

How the Plant Looks to the Airman



To those in the air any cement plant is but a single object in the great panorama stretched before them. In the two views above are shown the Great Lakes Portland Cement Corporation plant at Buffalo, N. Y. The first is taken from the south and the second from the northeast. The large body of water is Lake Erie and the canal the Union. The Cleveland-to-Buffalo highway unfolds before the plant

Cement Statistics for November

Shipments 2.9 Per Cent Above November, 1927—Total Production for First Eleven Months of the Year Almost 4,000,000 Greater Than for Same Period Last Year—Plants Operate at 77.4 Per Cent of Capacity

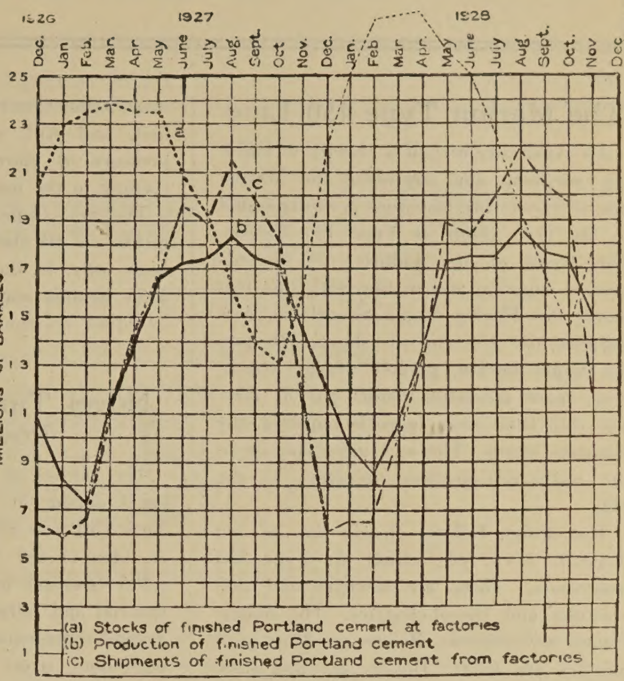
NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION APPEARS IN SLIGHTLY HEAVIER TYPE.

Relation of Production to Capacity

(Figures represent per cent)

	November 1928	November 1927	Oct. 1928	Sept. 1928	Aug. 1928
The month	**77.4**	75.9	87.1	91.7	93.1
The 12 months ended	**74.1**	73.7	73.8	73.7	73.5

	1927	1928	Increase
Production, Nov.	14,449,000	**15,068,000**	4.6
Shipments, Nov.	11,619,000	**11,951,000**	2.9
Stocks at end of Nov.	16,022,000	**17,696,000**	10.4
Total production for year to date	159,909,000	**163,637,000**	2.3
Total shipments for year to date	164,722,000	**168,071,000**	2.0
No. of plants reporting	154	**159**	3.2



Production, Shipments and Stocks of Finished Portland Cement, by Districts, 1927 and 1928, and Stocks in October, 1928

District	Production—November 1927	Production—November 1928	Shipments—November 1927	Shipments—November 1928	Stocks at end of month 1927	Stocks at end of month 1928	Stocks at end of October 1928*
Eastern Pa., N. J., and Md.	**3,345,000**	3,338,000	3,008,000	**3,153,000**	3,765,000	**4,196,000**	4,011,000
New York and Maine.†	804,000	**962,000**	**741,000**	725,000	1,205,000	**1,339,000**	1,102,000
Ohio, Western Pa., and W. Va.	1,542,000	**1,587,000**	986,000	**1,133,000**	2,069,000	**2,439,000**	1,985,000
Michigan	1,181,000	**1,409,000**	757,000	**811,000**	**1,501,000**	1,355,000	757,000
Wis., Ill., Ind., and Ky.	1,909,000	**1,973,000**	**1,284,000**	1,272,000	1,512,000	**1,624,000**	924,000
Va., Tenn., Ala., Ga., Fla., and La.	**1,452,000**	1,413,000	1,325,000	**1,350,000**	1,304,000	**1,683,000**	1,619,000
Eastern Mo., Ia., Minn., and S. Dak.	**1,411,000**	1,283,000	677,000	**777,000**	1,724,000	**1,972,000**	1,466,000
Western Mo., Nebr., Kan., and Okla.	883,000	**884,000**	**830,000**	726,000	1,265,000	**1,150,000**	993,000
Texas	525,000	**529,000**	**543,000**	451,000	252,000	**424,000**	346,000
Colo., Mont., and Utah	176,000	**238,000**	**175,000**	145,000	315,000	**398,000**	304,000
California	1,408,000	**1,173,000**	1,103,000	1,103,000	**776,000**	757,000	687,000
Oregon and Washington	173,000	**279,000**	190,000	**305,000**	334,000	**359,000**	385,000
	14,449,000	**15,068,000**	11,619,000	**11,951,000**	16,022,000	**17,696,000**	14,579,000

Production, Shipments and Stocks of Finished Portland Cement, by Months, in 1927 and 1928

Month	1927—Production	1928	1927—Shipments	1928	Stocks at end of month 1927	Stocks at end of month 1928
January	8,258,000	**9,768,000**	5,968,000	**6,541,000**	22,914,000	**25,116,000**
February	7,377,000	**8,797,000**	**6,731,000**	6,563,000	23,563,000	**27,349,000**
March	**11,450,000**	10,223,000	**11,100,000**	10,135,000	23,922,000	**27,445,000**
April	**14,459,000**	13,468,000	**14,350,000**	13,307,000	23,654,000	**27,627,000**
May	16,701,000	**17,280,000**	16,865,000	**18,896,000**	23,503,000	**25,984,000**
June	17,224,000	**17,469,000**	**19,761,000**	18,421,000	20,972,000	**25,029,000**
July	17,408,000	**17,445,000**	18,984,000	**19,901,000**	19,397,000	**22,580,000**
August	18,315,000	**18,730,000**	21,411,000	**21,970,000**	16,292,000	**19,374,000**
September	17,505,000	**17,856,000**	19,828,000	**20,460,000**	13,996,000	**16,799,000**
October	17,174,000	**17,533,000**	18,105,000	**19,836,000**	13,141,000	***14,579,000**
November	14,449,000	**15,068,000**	11,619,000	**11,951,000**	16,022,000	**17,696,000**
December	11,999,000	....	6,200,000	....	22,080,000	....
	171,908,000	....	170,922,000	....	....	....

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*Revised. †Maine began producing in April, 1928, and shipping in May, 1928.

Mill Equipment

The Marion Type 450 Line

An experience of half a century in building, servicing and improving the Marion line of excavating machines is incorporated in the new group of Type 450 shovels. The trend of the industry is towards greater capacity and in line with this tendency the Marion Steam Shovel Co. now supplies the 1¼ cu. yd. shovel. Despite the larger bucket, greater weight, sturdiness, more powerful motor—gas or electric—but little more space is required, the company states. The new units operate in the restricted quarters necessary to the old.

The design follows closely that of the Type 7, 1 cu. yd., which the Type 450 supersedes. These are electrics and gas-electrics and Diesel-electrics. The underframes are uniform. Booms are 22 ft. and handles are 15 ft. Houses are uniformly of steel. Boom hoist is standard equipment.

Crawlers have been lengthened about a foot to provide the additional stability necessary to the larger power plant and larger dipper. Base frames have been strengthened.

The Diesel-electric has for its power plant a Buda M. A. N. 92 h.p., 1000 r.p.m. Diesel with all the necessary accessories —fuel oil pump, water pump, fuel oil filter, lubricating oil filter, starter, etc. The Diesel is 4 cylinder, 4 cycle, solid injection and has a 5-bearing crankshaft. It is direct connected as in the gas-electric shovel—to a 25 kw. "drooping" voltage d. c. generator from which point towards the dipper it is a duplicate of the electric or gas-electric.

A New Copes Differential Water Pressure Regulating Valve

The Northern Equipment Company, Erie, Pennsylvania, announces a new differential water pressure regulating valve, the Copes Type SS valve, which has been designed to regulate the excess water pressure across the control valve of a feed water regulator in a boiler feed line. It can be used in connection with any feed water regulator to maintain the desired pressure drop, regardless of variations in boiler drum pressure or pump pressure, or friction loss in the feed line to the individual boiler.

The actuating element is a four-ply brass sylphon bellows which is subjected to, and influenced by, the differential water pressure. It is unaffected by feed water temperatures of 600 degrees Fahrenheit, and will withstand an unbalanced pressure of more than 400 pounds, according to the manufacturer.

The new Copes Type SS Valve is furnished in all sizes with straightway style body only, in the 250, 400, 600, 900 and 1350 pounds standard. It can be placed in either horizontal or vertical feed lines.

Novel Timken Exhibit at Power Show

The exhibit of the Timken Roller Bearing Company at the Power Show at New York City was planned throughout to give an idea of the universal use of tapered roller bearings in modern automotive, industrial and railway equipment. The background represents a city street, with building signs, street lights, and traffic complete. The two moving lines of traffic include practically every sort of vehicle, to be found in any city today. The building signs are practically a list of the industrial machinery to which the bearings have been successfully applied, and show the extent to which they are used. The miniature "Olympian" on the mountain track in the background typifies the growing use of the bearings on railway rolling stock.

In the foreground is one of the bearings developed for use on the roll necks of steel rolling mills. This in some respects is the most spectacular application that has been made. Loads run up into the hundred thousand pounds per bearing, and the service is probably the most severe on record.

The other bearings shown are suitable for different kinds of heavy duty applications in various types of industrial machinery. That on the left is a thrust bearing, and that on the right a steep angle bearing for shafts where proportionately heavy thrust loads are encountered.

INDUSTRIAL LITERATURE

Marion Publications

Among new publications are those of the *Marion Steam Shovel Company,* Marion, Ohio. They deal with the Type 480 2-yd. steam, which is *Bulletin* 336; Type 450, 1¼-yd. gas-electric, which is *Bulletin* 337; Type 480, 2-yd. electric rheostatic control, which is *Bulletin* 334; and *Bulletin* 335, which describes the Type 480, 2-yd., Ward-Leonard control shovel.

Flow Meters and Savings

The Brown Instrument Company, Philadelphia, Pa., has completed the publication of a new broadside entitled *"50 Chances for Savings in Your Plant."* This literature suggests the adoption in the individual plant of some of the 50 applications of flow meters listed respectively opposite the companies using them.

Fahralloy Publication

The November 30th edition of *"New Application and Unusual Uses for Amsco Manganese Steel,"* features a short article on crushing 250 tons of slag per hour. An all-manganese steel orange peel bucket is described at some length.

This is one of the publications of the *American Manganese Steel Company,* Chicago.

Allis-Chalmers Publications

The *Allis-Chalmers Manufacturing Company* has issued several new publications recently, among them being *Bulletin* 1087-*F*, on large polyphase induction motors; *Bulletin* 1228-*H* on Texrope drives; and another on polyphase induction motors, *Bulletin* 1118-*E*.

"Silent Gears"

A new publication issued by the *General Electric Company* is entitled "Silent Gears." The initial stages of development of both products is described, followed by physical specifications, application data and dimensions of blanks.

Notes from the Field

Cutler-Hammer Atlanta Office Moves

On December 1st, the Atlanta office of the *Cutler-Hammer Mfg. Co.* moved into new quarters at 150 Peters Street, S. W., Atlanta, Georgia. In addition to sales and engineering service on motor control apparatus and wiring devices, the new location provides warehouse facilities where many types of standard devices will be carried in stock for direct shipment to customers in that territory.

This service has been provided to anticipate the requirements of Cutler-Hammer customers because of the increasing electrical power application to industry in this section of the country. A. C. Gibson is manager in charge of the Atlanta office.